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BULLETIN

OF

MISCELLANEOUS INFORMATION.

1920.

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ERRATA.

Page 68, line 14 from top, *for* didi-vel *read* di- vel.
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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

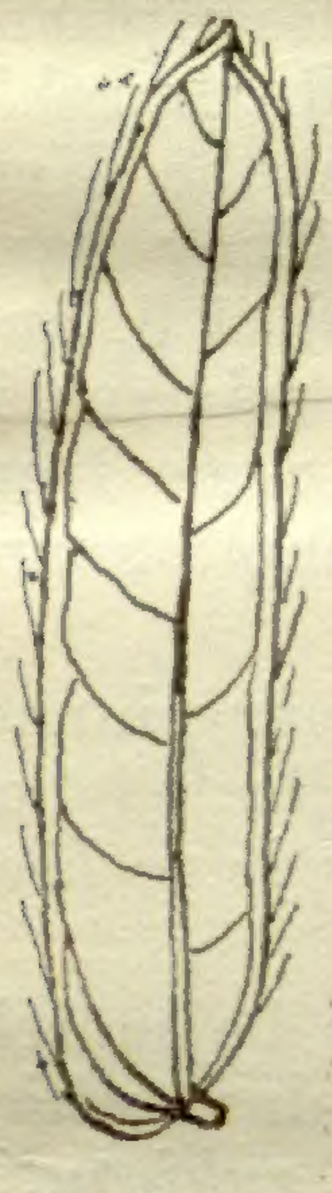
MISCELLANEOUS INFORMATION.

No. 1] [1920

I.—THE INDIAN SPECIES OF MIMOSA.

J. S. Gamble.

In the 'Flora of British India' only three species of Mimosa are recognized (vol. ii. p. 291). The First of these is the introduced *M. pudica*, Linn.,* the 'Sensitive Plant,' now so well established in the hotter and damper regions of India that it has become a very troublesome weed, most difficult to eradicate. One noticeable point about it is that while it has been admitted to a place in several Floras, it is only in Dr. Cooke's 'Flora of Bombay' that the curious stiff pectinate bracteoles are mentioned.



1. *Mimosa pudica.*

The Second species is *M. rubicaulis*, Lamk., which is given as found throughout practically the whole of India under a level of 5000 ft., and in which are included *M. octandra*, Roxb., *M. mutabilis*, Roxb., and *M. Rottleri*, Spreng., as well as the undescribed *M. spinosisiliqua*, Rottler. I have been permitted to examine carefully the whole of the collections in the Herbaria of Kew, Edinburgh, Calcutta and Madras, and I have come to the conclusion that they contain at least four different species, as I propose to show.

M. rubicaulis, the 'Acacie à tiges de ronce,' was described by Lamarck (Encyc. Meth. Bot. i. 20) in 1783 from specimens received by him from M. Sonnerat, very likely from Pondicherry or its neighbourhood. I have not seen the specimens, but M. Gagnepain

* The sketches which accompany this give what I consider to be the average form of the leaflets of the 7 species. They have been taken from the middle of the pinna because the uppermost and lowest ones usually differ a little from the middle ones which give the average. They have also been selected so as to show, as nearly as possible, the average shape.

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2. *M. rubicaulis.*

of the 'Museum d'Histoire Naturelle' in Paris tells me that there are two sheets of it in their Herbarium, one of them bearing Lamarck's autograph, and that the leaves and pod agree with those of Indian specimens I sent him for comparison, a comparison which he most kindly made. The description says that the leaves have five pairs of pinnae and 12–15 pairs of leaflets, which are large for the genus. The specimens which belong to true *rubicaulis* are easily separated and among them are those from which Wight prepared the excellent figure published in Hooker's Icones t. 156. The plant occurs only in South India and I have seen no specimens from north of the Godavari. It is represented in the Wallich Collection by nos. 5289 C (Herb. Russell) and D. (Herb. Wight) and the specimens in the Edinburgh Herbarium show that it is the *Mimosa Intsia* described by Roxburgh in Fl. Ind. ii. 565. Mr. W. G. Craib, in his paper on the climbing Acacias entitled 'Mimosa caesia and M. Intsia' (*Kew Bull.* 1915, p. 407) showed that *Mimosa Intsia*, Linn. Sp. Pl. 522 instead of being a climbing Acacia as commonly supposed, is, partly at any rate, *Mimosa rubicaulis*, Lamk. The confusion described so fully by Mr. Craib seems to exclude the possibility of taking *M. Intsia*, Linn. as the earliest name for the plant.

There is now the question of *M. octandra*, Roxb. Cor. Pl. t. 200 and Fl. Ind. ii. 564. Both Roxburgh's figure and descriptions seem to me to represent *M. rubicaulis*, Lamk., but Roxburgh's own specimens, named in his own handwriting, in the Kew Herbarium and Wallich Collection do not agree. They have 8–10 pinnae instead of 3–6, 14 pairs of leaflets instead of 8, and the leaflets are quite small. No locality for the specimens is given on the labels so that possibly they may have come from plants grown in the Calcutta Botanic Gardens. I cannot assume that they come from South India.

Of *M. mutabilis*, Roxb. Fl. Ind. ii. 564 with only four pinnae, there seems to be no specimen preserved. It was collected 'on the banks of the Ganges near Benares,' and this may have been the northern limit of *M. rubicaulis*.

Mimosa Rottleri, Spreng. Syst. ii. 206 appears to be merely a new name invented to associate Rottler with the plant which he called *M. spinosisiliqua*, admitted to agree with *M. rubicaulis*, Lam., by Sprengel. The description fits *M. rubicaulis* well enough.

Thus I conclude that the common species of the Southern part of the Madras Presidency is *Mimosa rubicaulis*, Lamk., including *M. octandra* of the 'Coromandel Plants.'

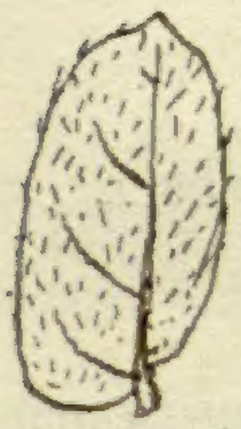
It now remains to identify the North Indian species of which a fine series exists in the Herbaria I have examined. The specimens come from the whole range of the Himalaya, from Afghanistan on the West to the Mishmi hills on the East, and extend to the Assam Valley, the Khasia Hills and Silhet. Southwards, it seems to come down to the Ganges, and further

South, but is apparently scarce. Specimens of my own collected in Hazaribagh and Palamow, and one recently sent by Mr. H. H. Haines from Singbúm show that it extends to the forests of Chota Nagpur. The chief character which distinguishes this plant is that of long leaves with eight to 12 pairs of pinnae each with 16 to 20 pairs of leaflets, most commonly 19. The pod is also narrow and has usually an acuminate apex, though sometimes even the same specimen shows it more or less rounded. The series of specimens shows a good deal of variation in pubescence, for Afghan and Punjab specimens are sometimes almost woolly while the pubescence seems to decrease as it proceeds eastwards. I propose to call it *Mimosa himalayana* as I cannot find that any collector or writer has done otherwise than identify it with *M. rubicaulis*. In the Wallich Collection at Kew there is a specimen with very narrow pod and small pubescent leaflets, collected by Buchanan-Hamilton at Bogdwar in January, 1809. I have quite failed to find Bogdwar on any map, but think it must have been in Bengal, for he spent most of 1809 in Rangpur and Purneah. The plant seems to me distinct from *M. himalayana* and to agree with one collected by Dr. C. A. Barber on the Godavari in the Madras Presidency. I propose to call it *M. Barberi* and to consider Dr. Barber's specimen as the type.

3. *M. himalayana.*

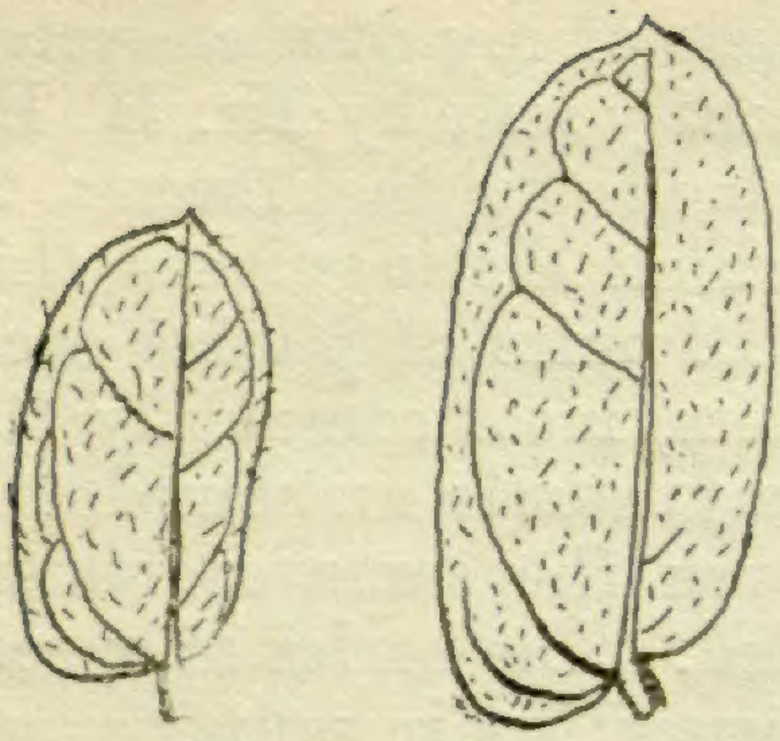
4. *M. Barberi.*

The THIRD species is *M. hamata*, Willd., a very well-marked one, well described by Willdenow to whom specimens had been sent by Klein, and having very small leaflets and a very prickly pod. Rottler called it *M. armata*, unaware, presumably, that it had already been described.



5. *M. hamata.*

Among the specimens which I collected myself in South India in the years 1882 to 1890 were several sheets which puzzled me much, and in 1902 I wrote to Major D. Prain, now Sir David Prain, then in charge of the Calcutta Gardens and Herbarium, about them. He very kindly went into the matter fully, and indicated to me that among the specimens identified as *M. hamata*, Willd., there were a great many which were certainly distinct from that species, which he agreed was the very small-leaved one so well described by Willdenow, and called *M. armata* by Rottler. I now recognize that among them there are two distinct species, (1) that which, in his remarks under *M. hamata*, Mr. Bentham, in Trans. Linn. Soc. xxx. 421, identified with the American *M. polyancistra*, and (2) one which I have described as *M. Prainiana*. As regards *M. polyancistra* I fully agree with Mr. Bentham. I have not seen Pavon's specimens of the American plant, but the Lane (not McLane) specimens from a garden in Cuba are at Kew and agree with the Indian ones except that the calyx and corolla are more hairy. My *M. Prainiana* differs



6. 7.

6. *M. polyancistra.*
7. *M. Prainiana.*

from *M. polyancistra*, as also from *M. hamata*, in several respects, and especially by having pods with 6–8 seeds and more and larger leaflets closely approximate instead of being far apart. I append to this paper the description of this new species as well as those of *M. himalayana* and *M. Barberi* already referred to.

If my views are correct, the number of distinct species of *Mimosa* in India will thus be raised from three to seven including the introduced but universally run-wild *M. pudica*.

The following is a brief Key to the species:—

Pinnae of the leaves 1-2 pairs digitately arranged	1. *pudica.*
Pinnae of the leaves more than 2 pairs, pinnate:—	
Leaves under 1 in. long with 3-5 pinnae; pods grey-puberulous	2. *hamata.*
Leaves much over 1 in. long:—	
Leaflets semi-cordate at base; sutures of pod with strong recurved prickles:—	
Pinnae 3-5 pairs about ·75 in. apart; leaflets 4-5 pairs, distant; pods usually acute at tip, ·6 in. broad	3. *polyancistra.*
Pinnae 5-7 pairs about ·5 in. apart; leaflets 7-8 pairs, touching; pods obtuse at tip, ·4-·5 in. broad	4. *Prainiana.*
Leaflets semi-rectangular at base; sutures of pod with few small or no prickles:—	
Pinnae 4-6 pairs, pinnules 10-15 pairs, ·4-·7 in. long; pods little curved, broad (·6-·7 in.)	5. *rubicaulis.*
Pinnae 6-8 pairs, pinnules 12-18 pairs, ·3-·4 in. long; pods much curved, narrow (·3-·4 in.)	6. *Barberi.*
Pinnae 8-12 pairs, pinnules 16-20 pairs, ·2-·3 in. long; pods little curved, narrow (·4-·5 in.)	7. *himalayana.*

Mimosa himalayana, *Gamble* [Leguminosae-Mimosoideae]; *M. rubicauli*, Lamk., affinis, legumine angustiore acuminato, et foliis longioribus circiter 10–12-jugis nec 4–6-jugis differt.

Frutex erectus, ramis striatis puberulis vel interdum fulvo-pubescentibus aculeis validis ornatis. *Folia* bipinnata, 12–20 cm. longa, rhachi puberula aculeata, juniora pubescentia; pinnae 8–12-jugae, 3–4 cm. longae; foliola 16–20-paria, 5–8 mm. longa, 2–3 mm. lata, oblonga, apice obtusa vel paullo acuta, mucronata, basi semi-rectangularia, hirsuta vel aliquando fulvo-pubescentia, costa margini superiori propinqua, nervis ad costae latus inferius 1–3 arcuatim junctis; stipulae subulatae; stipellae minutae. *Flores* rosei, in capitulis axillaribus ramulorum apices versus pedunculatis, circiter 1 cm. diametro cum staminibus; bracteolae

minutae, clavatae, pubescentes. *Calyx* campanulatus, 1 mm. longus, glaber. *Corolla* infundibularis, 2·5 mm. longa, glabra, lobis 4 oblongis tubo aequilongis. *Stamina* 8, longa, exserta. *Ovarium* glabrum. *Legumen* suturis decurrentibus e basi acuto stipitatum, apice longe acuminatum et mucronatum, circiter 8 cm. longum, 1 cm. latum, glabrum, rectum vel paullo curvatum, aculeis perpaucis vel nullis ad suturas ornatum. *Semina* 4–10.

North India. Along the whole of the outer Himalayan Range from Afghanistan to Assam at low elevations and in the forests of the Terai and Bhabar tracts, in the East up to about 1500 m. Southwards to the Ganges and Chota Nagpore.

Central India. At Gwalior (*Maries*).

Mimosa Barberi, *Gamble* [Leguminosae-Mimosoideae]; *M. himalayanae*, Gamble, affinis legumine angustiore et foliorum pinnis paucioribus pinnulis minoribus differt.

Frutex erectus, ramis striatis angulosis puberulis parce aculeatis. *Folia* bipinnata, 10–12 cm. longa, rhachi puberula parce aculeata; pinnae 6–8-jugae, 2–4 cm. longae; foliola 16–20-paria, 4–7 mm. longa, 2–3 mm. lata, oblonga, apice mucronata, basi semi-rectangularia, hirsuta, costa lateri superiori propinqua, nervis ad costae latus inferius 1–3 arcuatim junctis; stipulae lineares; stipellae minutae. *Flores* rosei, in capitulis axillaribus pedunculatis circiter 7 mm. diametro ramulorum apices versus. *Calyx* campanulatus, 1 mm. longus, glaber, dentibus 4 brevibus. *Corolla* infundibularis, 2·5 mm. longa, glabra, lobis 4 brevibus. *Stamina* 8, longe exserta. *Ovarium* puberulum. *Legumen* longe- (5–7 mm.) stipitatum, curvatum, basi acutum, apice acutum et mucronatum, 8–10 cm. longum, 8–10 mm. latum, glabrum, suturis haud sinuatis aculeis perpaucis vel nullis ornatis. *Semina* 8–10.

North India. At Bogdwar, Assam? *Wallich Cat.* 5289 A2 (ex Herb. Ham.).

Central India. At Tummileru, Godavari Agency, Dec. 1902, *Barber* 5282.

This species was, inadvertently, given in the 'Flora of the Madras Presidency' p. 421 as *M. angustisiliqua*, a name which would seem to be inadmissible.

Mimosa Prainiana, *Gamble* [Leguminosae-Mimosoideae]; *M. hamatae*, Willd., et *M. polyancistrae*, Benth., affinis, ab illa foliis multo longioribus et leguminibus glabris, ab hac pinnis regularibus 5–7-jugis et foliolis majoribus approximatis subtus minute glandulosis differt.

Suffrutex erectus, in ramulis et foliorum rhachi et pedunculis aculeis multis recurvis ornatus, fere glaber et glaucescens. *Folia* bipinnata, 5–9 cm. longa; pinnae 5–7-jugae, 2 cm. longae, 1–2 cm. distantes, rhachi pubescenti; foliola 7–11-juga, oblonga, basi semicordata, 5–7 mm. longa, 2–3 mm. lata, subtus minute glandulosa, glabra, nervis lateralibus inferioribus 3–4 inconspicuis, superioribus obscuris; stipulae lineares; stipellae minutae. *Flores* rosei, in capitulis pedunculatis axillaribus circa 1 cm. latis ramulorum apices versus paniculatis; pedunculi 1·5–2·5 cm. longi, fere semper aculeis recurvis ornati, pubescentes; bracteae

minutae, caducae; bracteolae sub calyce clavatae. *Calyx* perbrevis, ciliatus, vix 1 mm. longus, dentibus minutis acutis. *Corolla* infundibularis, 2 mm. longa, ad apices loborum acutorum minute puberula. *Stamina* 8, longe exserta. *Ovarium* minute pubescens vel glabrum. *Legumen* curvatum, glabrum, obtusum vel paullo acutum, ad 10 cm. longum, 10–12 mm. latum, suturis sinuatis aculeis reflexis conspicue ornatis. *Semina* 6–8 albuminosa, cotyledonibus planis orbicularibus 4 mm. latis.

Central India. Central Provinces, at Nagpore and Chanda, H. H. Haines 3251, 3249.

South India. Kistna District, at Masulipatam and Bezwada, *Gamble* 12603, 21757; Anantapur District, at Penekacherla, 360 m., *Gamble* 20832; Hyderabad, *Meebold* 1512; Kurnool District, at Atmakur, *Bourne* 4701 (leaflets rather larger and more distant, peduncles longer and less prickly).

West India. At Poona, *Jacquemont* 459.

II.—MOMORDICA COCHINCHINENSIS.

During the work connected with the preparation of the Monograph on "The Genus Strychnos in India and the East," by Capt. A. W. Hill, *K.B.*, Nos. 4–5, 1917, information was received from Mr. W. J. Tutcher, Director of the Botanical and Forestry Department, Hongkong, that seeds of *Momordica cochinchinensis*, Spreng., received from Szechuen, were sometimes sold in Hongkong as Strychnos seeds, and on sending for seeds of *Strychnos Nux-vomica*, L. he had received seeds of the *Momordica*. He added "I am informed by the Imports and Exports Office, Hongkong, that seeds of *Momordica cochinchinensis* are imported as *Strychnos Nux-vomica* seeds under the name of 'Muk Pit Tsze' from Annam and Haipong . . . . In a note I have received from Mr. A. N. Pullen, Government Apothecary, Hongkong, he says *Momordica cochinchinensis* seeds are certainly poisonous and appear to contain alkaloids similar, if not identical, with those contained in *Strychnos Nux-vomica*." In order to test the validity of this suggestion, seeds of the *Momordica* were submitted for examination to Professor H. G. Greenish, Director of the Pharmacy Research Laboratory of the Pharmaceutical Society of Great Britain, and under his supervision an investigation was conducted by Mr. E. R. Baines which resulted in the following report:—

Examination of the seeds of *Momordica cochinchinensis* received from the Royal Botanic Gardens, Kew.

"The average weight of each seed was 3·13 grammes, the seed-coats constituting 36·7 per cent. of the total weight and the kernels 63·3 per cent.

From part of the specimen received the seed-coats were separated and powdered. The moisture and ash were then determined and the powder exhausted with petroleum spirit, ether, chloroform and alcohol successively in a Soxhlet extractor.

The solutions obtained were evaporated to dryness and the residue dried at 100° C. and weighted. Each residue was then tested for alkaloids. The results may be tabulated as follows:—

	Per cent. of seed-coat.	Per cent. of seed.
Moisture	11·20 ...	—
Ash	1·20 ...	—
Petroleum spirit extract ...	0·33 ...	0·12
Ether extract	0·16 ...	0·06
Chloroform extract	0·44 ...	0·16
Alcohol extract	1·62 ...	0·59

No alkaloid was found in any of the residues.

The residue from the chloroformic solution was slightly green in colour and contained long needle-shaped crystals insoluble (or very sparingly soluble) in absolute alcohol. The quantity was too small to allow of their further examination.

The kernels were submitted to similar treatment. During the drying the colour changed from whitish to brownish, indicating that some change had taken place. The determination of the moisture is therefore unreliable and the figure obtained (1·56 per cent.) is not included in the table.

	Per cent. of kernels.	Per cent. of seed.
Petroleum spirit extract ...	47·06 ...	28·90
Ether extract	1·03 ...	0·65
Chloroform extract	0·17 ...	0·11
Alcohol extract	3·44 ...	2·18

No alkaloid was found in any of the residues.

The petroleum spirit extract was a pale brown, viscous oil. On exposure to the air it rapidly formed a film on the surface, and on further exposure in a flat-bottomed dish it was converted into a whitish, solid mass, easily reducible to a white powder. This powder was now insoluble in petroleum spirit and the usual solvents for fixed oils. This behaviour is similar to that of Chinese Tung Oil (from *Aleurites cordata*) which this oil also resembles in certain other of its characters.

The chloroformic extract contained needle-shaped crystals, insoluble in absolute alcohol, similar to those observed in the corresponding extract from the seed-coats.

The peculiar properties of Chinese Tung Oil render it valuable for certain technical purposes. In 1911 Hankow exported to foreign countries 6,143 tons, and to other Chinese ports 37,851 tons. In 1912 Germany imported 6,796 tons.

It is possible that the oil of *Momordica cochinchinensis* could be utilised in a similar way and it might prove a valuable oil if it could be obtained in sufficient quantity and at a suitable price. It is well worthy of further investigation for which purpose larger quantities of the seeds would be necessary."

In a letter accompanying the report Prof. Greenish wrote "So far no alkaloid has been found. The seeds contain a quantity of

fixed oil of remarkable character: it is described by Dymock and Hooper in *Pharmocographia Indica*. It rapidly dries (? by oxidation) to a solid which is easily powdered and then is insoluble in the usual fat solvents. We are examining this a little further. We have also found a crystalline substance, but in quantity so small that I fear we cannot do anything further with it unless we could get a much larger quantity of seed."

Ten pounds of seeds were subsequently obtained from Hongkong, and a further study of the oil was made under the direction of Prof. Greenish, by Messrs. C. E. Corfield, F.I.C. and E. Caird, B.Sc., A.I.C., in the Research Laboratory of the Pharmaceutical Society. The manner and the results of the research were communicated in the following report:—

The Fat of Momordica Seeds.*

At the request of the Assistant Director of the Royal Botanic Gardens, Kew, an examination of the fat contained in the seeds of *Momordica cochinchinensis*, Spreng. was undertaken with the view of ascertaining whether it might prove of commercial value.

Momordica cochinchinensis is a cucurbitaceous plant indigenous to Bengal, Tenasserim, the Deccan Peninsula, Formosa, and the Philippine Islands. The seeds are described by Hooker (Flora of British India, II. p. 618), as "$\frac{7}{8}$ by $\frac{5}{8}$ by $\frac{1}{5}$ in. thick, many, horizontal, irregular, ovate, compressed, black, corrugated on the margins, sculptured on the faces."

Very little information has been published concerning the fat of these seeds. In the *Pharmacographia Indica*† the statement is made that the seeds yield to light petroleum ether 43·74 per cent. of a slightly greenish oil which, smeared on a glass plate and exposed to a temperature of 100° C. could be scraped off the glass as a white powder which, when boiled with petroleum ether, yielded only a trace of oil.

A general examination of the seed-coats and kernels has been made by Greenish and Baines, with the following results:—

The average weight of each seed was 3·13 grammes, of which the seed coat weighed 36·7 per cent., and the kernels 63·3 per cent.

A.—Seed-coats.

The powdered seed-coats were extracted successively with different solvents; the solvent evaporated, and the residue dried at 100° C.

	Per cent. of seed-coat.	Per cent. of seed.
1. Petroleum spirit extract ...	0·33 ...	0·12
2. Ether extract	0·16 ...	0·06
3. Chloroform extract	0·44 ...	0·16
4. Alcohol extract	1·62 ...	0·59

No alkaloid was found in any of the residues.

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* See Pharmaceutical Journal and Pharmacist, Jan. 17, 1920, pp. 43–44.

† *Pharmacographia Indica*, ii, p. 77.

B.—Kernels.

These were submitted to a process of exhaustion similar to that applied to the seed-coats.

	Per cent. of kernel.	Per cent. of seed.
1. Petroleum spirit extract ...	47·06 ...	28·90
2. Ether extract	1·03 ...	0·65
3. Chloroform extract	0·17 ...	0·11
4. Alcohol extract	3·44 ...	2·18

Again, it is interesting to note that no alkaloid was present in the residue. The residue from the petroleum spirit extract was a pale brown, viscous oil. On exposure to air, it rapidly filmed on the surface, and on continued exposure it was converted into a whitish solid mass, easily reducible to a powder.

The result of these experiments led to the present examination of the seeds, with a view to ascertaining as to whether the oil would be of commercial value as a drying oil.

Since, as will be shown later, the heating of the oil to a temperature approaching 100° C. had the effect of altering the composition of the oil, a method, other than that of extraction by means of a solvent and subsequent evaporation, was employed. Cold compression yielded little, since the fat was fairly solid. With the application, however, of slight heat the fat was readily yielded, and a method of extraction based upon this result was adopted. After removal of the seed-coats the kernels were coarsely powdered and submitted to pressure, the necessary heat being obtained by means of a steam coil round the press, adjusted to produce in the mass, a temperature of about 40° C. The fat, of which a good yield was obtained, was greenish-brown in colour; had an unpleasant and penetrating odour; on cooling solidified to a pale green granular mass; when worked at atmospheric temperature it became fluid. The green colour was most probably due to traces of chlorophyll from the coating of the cotyledons.

On examination the fat gave the following constants:—

Saponification value	185·2
Acid value	1·9
Iodine value	23·4
Refractive index (40° C.)	1·496
Ester value	183·3
Melting point	28° C.–32° C.
Unsaponifiable matter	a trace

After saponification of the fat the alcohols were separated, and were found to consist principally of glycerol, the residue giving no evidence of the presence of wax-alcohols. The fatty acids, on separation, were found to be yellowish-brown in colour and solid. The following constants were observed:—

Melting point	46°–51° C.
Solidifying point	44°–42° C.
Acid value	188·3
Iodine value	about 40

Since some considerable difficulty was encountered in determining the iodine value, the figure is not taken as final. Apparently the absorption is accompanied by the formation of some unstable compound, which is decomposed by sodium thiosulphate. From these constants, it appears that the fat consists chiefly of the glyceryl esters of fatty acids, the larger portion of which are saturated, but no attempt has been made to determine the composition of the fat.

On exposing the fat to the atmosphere, a change in colour and in form was noticed. The fat gradually lost its green colour and assumed a pale yellow shade; a marked tendency for films to agglomerate was noticed, and finally it became granular in appearance. A systematic examination of these films was conducted with a view to determining the cause of the changes. The following tables will show the course of the experiments:—

A.—3·9536 *grammes, exposed to air and light.*

Time of exposure in days.	Actual gain.	Gain per gramme per day.
1 ...	0·0024 gm. ...	0·00061 gm.
2 ...	0·0070 „ ...	0·00177 „
3 ...	0·0216 „ ...	0·00546 „
4 ...	0·0312 „ ...	0·0078 „
5 ...	0·0504 „ ...	0·00425 „

These figures are no measure of complete change, since, owing to agglomeration, the lower layers were not sufficiently exposed.

B.—3·5913 *grammes, exposed to air, without access of light.*

Time of exposure in days.	Actual gain.	Gain per gramme per day.
1 ...	0·0003 gm. ...	0·0000835 gm.
2 ...	0·0011 „ ...	0·0003063 „
3 ...	0·0025 „ ...	0·0006961 „
4 ...	0·0074 „ ...	0·002060 „
7 ...	0·0082 „ ...	0·000761 „

In this experiment, there was no agglomeration, and the only change in form was the appearance of small white points in the green exposed surface.

C.—3·9894 *grammes, exposed to light in nitrogen.*

For a period extending over seven days no change in weight took place.

From the above figures, it is evident that the change observed is one of oxidation, which is immensely accelerated by the presence of light, since in that experiment in which the fat was excluded from light the change was extremely small, and only affected the most exposed portions. The effect that this oxidation has upon the solubility of the fat in the ordinary solvents was next ascertained. The data are tabulated below, and will again

show that there was practically no change when the fat was kept in the dark:—

	Petroleum spirit.	Ether.	Carbon tetrachloride.	Alcohol 97%.
Original fat	Soluble ...	Soluble ...	Soluble ...	Insoluble.
Exposed in light	Insoluble ...	Insoluble ...	Insoluble ...	Insoluble.
Exposed in dark	Faintly opalescent solution	Faintly opalescent solution	Faintly opalescent solution	Insoluble.

Lastly, the effect of heat upon the appearance and properties of the fat was observed:—

A.—3·5712 *grammes, exposed to air and light at* 100° *C.*

Time of exposure in days.	Actual gain.	Gain per gramme per day.
1 ...	0·1912 gm. ...	0·05352 gm.
2 ...	0·0614 „ ...	0·03714 „
3 ...	0·0140 „ ...	0·00392 „
4 ...	nil. ...	... nil.

At this point the weight of the film had become constant, indicating that complete oxidation, and other change, if any, had occurred during the period of three days. The appearance of the heated film was markedly different from that of the film exposed at atmospheric temperature. The green colour was lost and the fat assumed a granular, gelatinous form, of a pale brown colour, finally becoming stiff, and easily disintegrated. The effect of heating during oxidation was, as in the case of oxidation at ordinary temperatures, to render the product insoluble in the fat-solvents petroleum spirit, ether, and carbon tetrachloride, while it remained insoluble in alcohol.

The following is a record of observations made on heating the fat slowly from 15° C. to 240° C.:—

15° C.– 50° C.—The fat became less granular, finally assuming a homogenous appearance, and was of a dark brown colour.
50° C.–100° C.—No change observed, except that the colour assumed a redder tint.
100° C.–110° C.—More transparent.
120° C.–130° C.—Colour still lighter.
130° C.–180° C.—Appearance of small bubbles, probably due to the escape of a small quantity of volatile matter.
200° C.–240° C.—A greenish-brown mobile liquid.

On cooling, the fat remained as a brown, viscous liquid of the consistency of castor oil, and the solubility remained as that of the original fat. On exposure in thin layers this liquid did not exhibit the character previously recorded of the fat. During two days, no film appeared, whereas on further exposure the thinnest portions formed a transparent skin of the nature of varnish.

In conclusion, the evidence is that the fat shows certain characteristics of drying oils, such as Tung Oil, without the property of producing a varnish as in the case with drying oils, such as linseed oil, whereas, after heating, it behaves as a semi-drying oil, and it would seem that, in this condition, admixed with drying oils, it might be used in the production of paints and varnishes.

A consignment of seeds of *Momordica cochinchinensis* received through the kind offices of Mr. W. J. Tutcher, Hongkong, was sent to the Imperial Commissioner of Agriculture, West Indies (*see* Agric. News, Feb. 22, 1919). Some of these were entrusted to Mr. J. Jones, Curator of the Botanic Gardens, Dominica, and in the Agric. News of November 1, 1919 (vol. xviii, No. 457), on p. 347, it is reported a fruit has matured on one of the plants raised from the seed received in February. The fruit weighed $3\frac{3}{4}$ lbs. and contained 42 seeds, weighing 6 ozs. Agric. News, Dec. 13, 1919, p. 393.

It is hoped that the plant may be grown successfully in the West Indies and the oil from the seeds may be found to be of commercial value.

Momordica cochinchinensis has been figured in the Botanical Magazine (Ser. III, vol. xv), Tab. 5145, and there is a description of the plant with a figure in Catalogue des Produits de l'Indo-Chine, Tome i, p. 180, where it is stated that a well-clarified oil is made from the seeds.

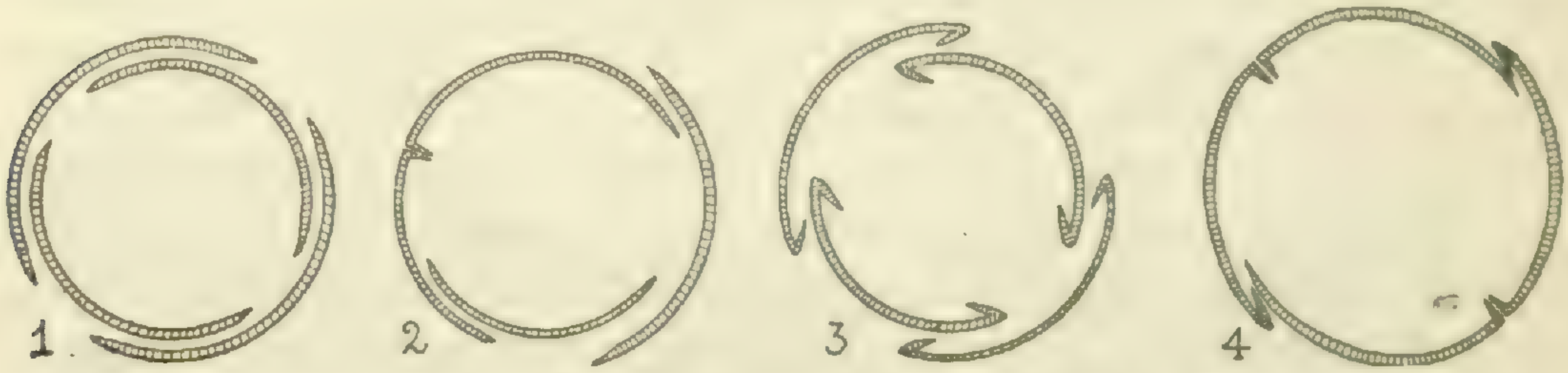
III.—CLEMATOPSIS, A PRIMITIVE GENUS OF CLEMATIDEAE.

J. Hutchinson.

The genera *Clematis* and *Naravelia*, comprising the tribe *Clematideae* of *Ranunculaceae*, have generally been regarded as sharply differentiated from the remainder of the family by their usually shrubby habit, opposite leaves, and induplicate-valvate sepals.* And the Tribe *Clematideae* is so described in the majority of local floras and in textbooks. While looking over the genus *Clematis* recently, however, I was impressed by the markedly *imbricate* aestivation of the sepals of several species from Madagascar and South Tropical and Subtropical Africa. This aestivation appeared superficially to be of the ordinary imbricate type, but on dissection of the buds of several species, the types of aestivation shown in diagrams 1–4 were found to occur. These examples are remarkable in that they show almost every degree of aestivation linking up the imbricate with the induplicate-valvate type. In diagram 1, which is drawn from a flower of *Clematopsis scabiosifolia*, the aestivation is simply imbricate; in no. 2, that of *C. speciosa*, it is partly imbricate and

* In the addenda to vol. i. of Benth. & Hook. f. Gen. Plant. the following note occurs:—"Clematis, in charactere, post Sepala . . . . . valvata, adde . . . . . rarius (in speciebus paucis Africae tropicae) imbricata." Prantl. (Engl. & Prantl. Pflanzenf. iii. 2) has a section of *Clematis* with imbricate aestivation which he named *Pseudanemone*.

partly induplicate-valvate; in no. 3, *C. Stanleyi*, we see a gradation which links up with no. 4, *C. Kirkii*, where the aestivation approaches most nearly that of typical *Clematis*, *i.e.*, induplicate-valvate, except that the overlapped margins are not inflexed.



Diagrams showing different types of aestivation in *Clematopsis*.

In the early part of last century the MSS. name *Clematopsis* appears to have been given by Bojer to a few Mascarene species showing this feature, the name first appearing as a *nomen nudum* in Hooker's Icones Plantarum, vol. i. t. x. (1837), wherein several of the species are described as *Clematis*. At tab. 10 of that work, which depicts *Clematis Bojeri*, Hook. [=*Clematopsis villosa*, Hutchinson], Sir William Hooker makes the following observation:—"This is one of several species of Clematis sent me from the island of Madagascar by the late Dr. Lyall, differing strikingly from any described species, and of which has been constituted a new genus in Mr. Bojer's MSS. under the name of *Clematopsis*. But I am not aware of any character to warrant such a separation. All have singularly large flowers and most of them very long peduncles."

As a *valvate* aestivation has no doubt been derived from an *imbricate* one, at any rate in the *Ranales*, the phyletic significance of this remarkable transition should not be lost sight of, linking up, as it clearly does, the tribes *Anemoneae* (through *Anemone* § *Pulsatilla*) and *Clematideae*. It seems desirable, therefore, that Bojer's views as to its generic importance, though expressed only by the MSS. name, should be maintained. If we take into account the somewhat slender means by which several other genera of *Ranunculaceae* are separated, then *Clematopsis* has good claims to recognition. It is true, as remarked upon by Baillon,* that in some of the larger-flowered species of *Clematis*, such as *C. florida*, from which many of the beautiful garden races have been derived, the sepals become imbricate *after* the flowers have opened, but in the bud stage they are valvate.

In regard to the opposite leaves, there is an occasional occurrence which seems to strengthen the view as to the intermediate position of *Clematopsis* between *Anemone* (alternate leaves) and *Clematis* (opposite leaves). This is that when the nature of *C. Stanleyi* (q.v.) is disturbed by cultivation, it sometimes produces *alternate* leaves, thereby becoming to all intents and purposes a species of *Anemone*. Another "*Anemone* feature" is the involucrate leaves of three Angolan species (*see* key).

* Histoire des Plantes, i, 87 (1867).

The species of *Clematopsis* found in the elevated regions of Angola would appear in some places to form almost a dominant feature of the vegetation. According to the Welwitsch Catalogue of Angolan plants, the *Ranunculaceae* produce a striking effect upon the physiognomy of the forest landscape by the presence of immense masses of two erect species [of *Clematopsis*], so that large tracts of pasture ground, situated amidst the forests, during the flowering season, look at a distance as if covered with snow. Whilst on an excursion towards the confluence of the Lopollo and Ferao streams, Welwitsch "enjoyed ample opportunity to admire the scarcely imaginable magnificence of the two erect species each with whitish-red flowers 2–2½ in. in diameter, and with stems 3–4 ft. high."

Whether, in connection with the theory here advanced that *Clematis* has probably arisen through *Clematopsis* from the genus *Anemone*, the southern Plateau of Africa, part of the ancient "Gondwana Land" of Suess, which still connected the African continent with Madagascar and India as late as the Cretaceous, and Africa and Madagascar well into the Tertiary period,* has been the breeding ground for the evolution of *Clematis*, whence they have spread throughout the northern hemisphere, may be left to conjecture. In the absence of some such explanation, it would be difficult to account for the Indo-Malayan genus *Wormia* (*Dilleniaceae*) and the Australian *Hibbertia* in Madagascar. If a detailed examination of the distribution and structural peculiarities of the *Ranunculaceae* from the Southern Hemisphere were undertaken, probably some other interesting facts would be brought to light regarding the phylogeny of those from the Northern Hemisphere. It has already been shown in the case of *Caltha*† that the southern species differ markedly from their boreal relatives. The solitary *Anemone* of Tasmania, *A. crassifolia*, Hk. f., is of a very peculiar habit, and it seems a significant fact that the 20 or so species of *Clematis* endemic to New Zealand should all be dioecious, whilst Huth‡ in his monograph of the genus *Delphinium* remarks on the peculiar structure and isolated position of the only two species, *D. macrocentrum*, Oliv. (Ic. Pl. t. 1501) and *D. Leroyi*, Franch., which occur south of the Equator, in the Masai district of East Africa and Kilimanjaro respectively.

I am much indebted to Mr. E. G. Baker, of the Natural History Museum, for allowing me to examine the sketches of *Clematopsis* he made in the Berlin Herbarium, and to Miss D. M. Rolfe for assistance in preparing the plate.

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* cf. Arldt, Die Entwicklung der Kontinente und ihrer Lebewelt, Karten 19–21 (1907).

† The genus *Caltha* in the Southern Hemisphere, A. W. Hill in Ann. Bot. xxxii. 421–435 (1918).

‡ Monographie der Gattung *Delphinium*, in Engl. Bot. Jahrb. xx. 473 (1894).

Explanation of plate :—1, *Clematopsis Stanleyi* (after Bot. Mag.); 2, *C. trifida*; 3, *C, oligophylla*; 4, *C. anethifolia* (after Hook. Ic. Pl.); 5, flower of *C. speciosa* (orig.); all slightly more than $\frac{1}{2}$ nat. size.

KEY* TO THE SPECIES OF *Clematopsis*.

*Uppermost pairs (or 4) of leaves (of at least the terminal flower) green like the other leaves and not brightly coloured, nearly always remote from the perianth :

Flowers mostly about 3 at the apex of each shoot ... ... 1. *C. Kirkii.*

Flowers solitary at the apex of each shoot or stem :

†Lower leaves simply pinnate, trifoliolate or sub-entire :

‡Stems more or less solitary, erect ; African species :

Four of the upper leaves whorled and forming an involucre ; Angolan species.

Involucral leaves simple, toothed :

Sepals 6 ... ... 2. *C. Teuczii.*

Sepals 4 ... ... 3. *C. speciosa.*

Involucral leaves trifoliate, with narrow leaflets ... ... 4. *C. chrysocarpa.*

Upper leaves in distant pairs, not forming an involucre :

Densely tomentose all over ; lateral leaflets narrow, entire or unidentate ; Angolan species ... 5. *C. argentea.*

Laxly pilose or shortly pubescent ; lateral leaflets broad, usually with more than one tooth :

Leaves up to 18 cm. long ; sepals strongly ribbed on the back 6. *C. katangensis.*

Leaves not more than 10 cm. long ; sepals not ribbed :

Achenes not longer than broad, more or less rhomboid, with long and very slender tails sparsely pilose towards the tips ... 7. *C. Oliveri.*

Achenes much longer than broad, narrowly turbinate, with comparatively short tails densely pilose to the tip ... ... 8. *C. Stuhlmannii.*

‡‡Stems several from a decumbent rhizome ; pedicels elongated ; Mascarene species ... ... 9. *C. trifida.*

††Lower leaves more or less bipinnate, rather roughly and permanently hairy ; Angolan species ... ... 10. *C. scabiosifolia.*

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* This key is as good as can be put together from the material seen, which in some cases is rather scanty.

†††Lower leaves more than bipinnate, much divided with rather narrow segments:

Leaves rather coarse, more or less densely hairy; African species ... 11. *C. Stanleyi.*

Leaves usually finely cut, glabrous or nearly so; Mascarene species:

Leaves about 3 cm. long; segments short about 1·5 mm. broad ... 12. *C. oligophylla.*

Leaves over 5 cm. long, segments long and narrowly linear, scarcely 1 mm. broad ... ... 13. *C. anethifolia.*

**Uppermost pair of leaves coloured and bract-like, entire or sub-entire, fairly close up to the perianth, sharply differentiated from the foliage leaves:

Leaves finely divided, segments about 2–5 mm. broad ... ... 14. *C. pimpinellifolia.*

Leaves simply pinnate, leaflets 1·5-2 cm. broad ... ... 15. *C. villosa.*

1. **Clematopsis Kirkii,** *Hutchinson*, comb. nov.

Clematis Kirkii, Oliv. Fl. Trop. Afr. i. 5 (1868); Eyles in Trans. Roy. Soc. S. Afr. v. 352 (1916). *Clematis villosa*, var. *normalis*, O. Kuntze, Monogr. Clemat. 173 (1885). *Clematis Busseana*, Engl. Bot. Jahrb. xlv. 269 (1910).

Tropical Africa. North-West Rhodesia: Fort Hill, Tanganyika Plateau, 1050–1200 m., July, 1896, *A. Whyte;* Kambole, south-west of Lake Tanganyika, 1500 m., *W. H. Nutt* (1896); Fwambo, *A. Carson* 46, 65. Near Mumbwa, 15° S., 28° E., *Mrs. Macaulay* 601; Katinia Hills, under bushes, *T. Kässner* 2160, 2191. Southern Rhodesia: Odzani River Valley, Umtali district, *A. J. Teague* 23; near Chirinda, 1100 m., *Swynnerton* 1763. Shire Highlands, *J. Buchanan* 80, 428; without definite locality, *J. Buchanan* 638, 763. Portuguese East Africa: Manganja Hills, 900 m., fr. 4 Mar. 1862, *J. Kirk* (type). East African Protectorate: Ussagara Mountains, in damp meadows, about 1700 m., fls. Sept. 1900, *W. Busse* 295. Nyasa Highlands; Kyimbila, 25 Nov. 1907, *G. Stolz* 146. Kavironda, 1200-1500 m., *Scott Elliot* 7022, 7154. Belgian Congo: Sekanju, open plain, 12 Jan. 1909, *T. Kässner* 2988; Kipaila, *T. Kässner* 2543.

2. **Clematopsis Teuczii,** *Hutchinson*, sp. nov.

Clematis villosa, var. *Teuczii*, O. Kuntze, Monogr. Clemat. 174 (1885).

Rhizoma polycephalum; caulis erectus, simplex, longitudinaliter sulcatus, medio 4–5 mm. diametro, pilis longis debilibus reflexis laxe instructus. *Folia* alterna, superiora 4 subverticillata, simplicia, anguste obtriangularia, basi longe cuneata, 12–14 cm. longa, 4–5·5 cm. lata, superne lobulato-dentata, e basi prominenter 5–nervia, utrinque pilis longis debilibus pubescentia; petioli circiter 1 cm. longi, sulcati. *Pedunculus* monocephalus, robustus, circiter 18–20 cm. longus, laxe pubescens. *Sepala* (ex icon. Bakeriano) 6, ovato vel ovato-lanceolata. *Infructescentia*

subglobosa, cinereo-brunnea (*Gossweiler*), circiter 10 cm. diametro. *Achaenia* turbinata, fere 1 cm. longa, pilosa, stylo circiter 5 cm. longo dense sericeo-piloso coronata.

Tropical Africa. Angola: Malange, *Mechow* 305 (only a sketch of type seen at the Natural History Museum, S. Kensington). Malange, on high ground near Sansala Catombe, fr. 16th June, 1908, *J. Gossweiler* 1469.

Mr. Gossweiler described the plant as follows:—" A perennial with many-headed caespitose rootstock; stem strictly ascending, not branched, all parts softly hairy; infructescence globular, silvery brown!"

3. **Clematopsis speciosa,** *Hutchinson*, sp. nov.

Caulis erectus, fruticosus, verosimiliter simplex, profunde sulcatus, longe rufo-pilosus. *Folia* superiora involucrata tantum visa, simplicia, obovata, acuta, basi longe attenuata, circiter 12 cm. longa et 5 cm. lata, dimidio parte serrata, inferne integra, chartacea, utrinque pilis curvatis laxe pilosa; nervi laterales e basi ascendentes, infra prominuli. *Flos* solitarius, speciosissimus, usque ad 15 cm. expansus, longe pedicellatus. *Sepala* 4, ovato-lanceolata, acuta, tenuiter chartacea, ad 7 cm. longa et 3 cm. lata, extra striata et laxe pilosa, intra breviter pubescentia. *Filamenta* pilosa, circiter 1 cm. longa; antherae 0·8 cm. longae. *Achaenia* numerosa, dense villosa, matura non visa.

Tropical Africa. Angola: 15° 05′ E. Long., 12° 44′ S. Lat., alt. 1360 m., *Dr. F. C. Wellman* 1792.

This is a magnificent plant and should be introduced to cultivation.

4. **Clematopsis chrysocarpa,** *Hutchinson*, comb. nov.

Clematis chrysocarpa, Welw. ex Oliv. Fl. Trop. Afr. i. 5, partim (1868); Hiern in Cat. Afr. Pl. Welw. i. 2 (1896). *Clematis villosa*, subsp. *chrysocarpa*, O. Kuntze, Monogr. Clemat. 174 (1885).

Descr. emend.—*Caules* erecti, usque ad 0·75 m. alti, profunde sulcati, medio circiter 5 mm. crassi, patule pilosi, nodiis subvillosis, internodiis plerumque circiter 6 cm. longis. *Folia* opposita, trifoliolata vel rare integra, fere sessilia, superiora verticillata, usque ad 12 cm. longa, prominenter nervosa, parce pilosa, foliolo terminali elongato-oblanceolato breviter petiolulato 5–6 cm. longo 1·5–2 cm. lato apicem versus parce dentato vel subintegro, lateralibus linearibus vel oblongis 4–5 cm. longis superne parce dentatis; petioli 1–1·5 cm. longi, complanati. *Flos* solitarius, longe (usque ad 14 cm.) pedicellatus, pedicello subdense et longe piloso. *Sepala* 4, elliptica, dorso ecostata, apiculata, 3 cm. longa, 2 cm. lata, extra pilosa, intra glabra. *Filamenta* complanata, lata, pilosa, fere 1 cm. longa; antherae 7 mm. longae. *Achaenia* turbinata, 8 mm. longa, appresse pilosa, superne fere villosa, stylo elongato 6 cm. longo flavovilloso coronato.

Tropical Africa. Angola: Huilla; in shortly bushy, rocky, rather dry stations between Lopollo and Nene, at a place called

Ferra de Sola, not abundant, fl. Feb. Apr. 1860, *Welwitsch* 1222. Kubango; apparently widely caespitose, stems erect, 1–2 ft. high, leaves fleshy, deep green; flower terminal, resembling a large tulip in shape, all parts lurid white, on a decayed and overgrown anthill in moist meadow near the fort Colui, 14–10–05, *Gossweiler* 2153, 3642.

Hiern (l.c.) points out that Grant's specimen from Usui district, Uganda, is probably the same as the plant named *C. Stuhlmannii*, Hieron. In the present paper it is described as *Clematopsis Oliveri*, a near ally of *C. Stuhlmannii*.

C. chrysocarpa is another very fine species, remarkable for the whorled upper leaves forming an involucre after the manner of an *Anemone*. Its lower leaves are, however, strictly opposite and in pairs, as in *Clematis*.

5. **Clematopsis argentea,** *Hutchinson*, sp. nov.

Clematis argentea, Welw. ined. *Clematis villosa*, subsp. *argentea*, O. Kuntze, Monogr. Clemat. 174 (1885); Hiern in Cat. Afr. Pl. Welw. i. 2 (quoad forma *acutiloba*).

Caules e rhizomate lignoso numerosi, erecti, usque ad 1 m. alti, laxe foliati, superne ramosi, ubique dense tomentosi, internodiis superioribus circiter 8 cm. longis. *Folia* inferiora non visa, superiora pinnata, usque ad 12 cm. longa, angusta, utrinque dense appresse villosa, foliolis bijugis, terminali profunde trilobato basi cuneato 4·5 cm. longo 3·5 cm. lato, lateralibus oblanceolatis parce lobulatis apice mucronatis glabrescentibus. *Alabastra* tantum visa, ovoidea, breviter acuminata, externe dense tomentosa. *Infructescentia* circiter 9 cm. diametro; pedicelli circiter 7 cm. longi, tomentosi. *Achaenia* turbinata, sericea, stylo plumoso circiter 6 cm. longo coronata.

Tropical Africa. Angola: Pungo Andongo; frequent in bushy stations about Quifinda, near Quisonda, fr. Mar. 1857, *Welwitsch* 1220.

6. **Clematopsis katangensis,** *Hutchinson*, sp. nov.

Suffrutex erectus, usque ad 1 m. altus; caulis prominenter sulcatus, breviter pubescens, medio circiter 6 mm. crassus, superne subtomentosus. *Folia* pinnata, usque ad 18 cm. longa, foliolis bijugis, terminali elliptico-oblanceolato parce dentato, lateralibus paullo minoribus lobulato-dentatis utrinque brevissime pubescentibus demum fere glabris, nervis infra prominentibus, venis laxis; rhachis sulcata, breviter pubescens. *Flores* solitarii, terminales, circiter 7 cm. expansi; pedicelli circiter 6·5 cm. longi, apicem versus molliter tomentosi. *Sepala* 4, valde crassa, acuta, circiter 3·5 longa et 2·5–3 cm. lata, dorso prominenter 5-costata, breviter appresse sericeo-villosi, 2 interioribus marginibus planis molliter tomentellis. *Filamenta* pilosa; antherae 8 mm. longae. *Carpella* et stylus sericeo-villosa. *Fructus* non visus.

Trofical Africa. Belgian Congo: Katanga; Loooi River, Nov. 1910, *T. Kässner* 3347 (Type in Nat. Hist. Mus.).

7. **Clematopsis Oliveri,** *Hutchinson*, sp. nov.

Clematis chrysocarpa, Oliv. Fl. Trop. Afr. i. 5 (1868), partim, non Welw. *C. villosa*, subsp. *chrysocarpa*, forma *stipulata*, O. Kuntze, Monogr. Clemat. 174 (1885) partim.

Caules e rhizomate polycephalo erecti, sulcati, medio circiter 4 mm. crassi, breviter pubescentes, internodiis 6–8 cm. longis. *Folia* subsessilia, trifoliata vel pinnata, usque ad 10 cm. longa et 6 cm. lata, chartacea, utrinque breviter pubescentia, demum subscabrida, foliolis obovatis parce lobulato-dentatis. *Flores* solitarii, circiter 5 lm. diametro, nutantes? breviter vel longe (ad 12 cm.) pedicellati, pedicello molliter tomentoso. *Sepala* 4 vel 6, oblongo-elliptica, circiter 2·5 cm. longa et 1·2 cm. lata, utrinque molliter tomentella. *Filamenta* complanata, inferne pilosa, superne glabra, 1 cm. longa; antherae 5 mm. longae. *Carpella* ellipsoideo-turbinata, sericeo-pilosa, stylo laxe plumoso **5–6 cm. longo gracili coronata.**

Tropical Africa. 'White Nile,' *Petherick* (1862). Uganda: common on waste grounds of Ususi, Nov. 1861, *Speke & Grant* 190. Koki, 1200 m., *M. T. Dawe* 391. Elgon District, *Sir Evan James*; between Mumias and Lubwas. 1200–1350 m., *A. Whyte*. British East Africa: Nyanza basin. 1200–1350 m., *E. Battiscombe* 681; without definite locality, *H. Powell* 90. East African Protectorate: Uhehe Mts., *Goetze* 673. North Nyasaland: Kondowe to Karonga, 600–1800 m., July 1896, *A. Whyte*.

8. **Clematopsis Stuhlmannii,** *Hutchinson*, comb. nov.

Clematis Stuhlmannii, Hieron in Engl. Pfl. Ost-Afr., C. 180 (1895). *Clematis Goetzei*, Engl. Bot. Jahrb. xxviii 388 (1900)?

Tropical Africa. Uganda: Hunga, herb with white flowers, fr. Nov. 18, 1903, *A. G. Bagshawe* 381. East African Protectorate: Kagehi, *Stuhlmann* 3491; Kinuni, Karagwe, 1500 m., *Stuhlmann* 1658; Kassesse, Karagwe, 1500–1600 m., *Stuhlmann* 1670; Karagwe and Urundi, 1200–1500 m., *Scott Elliot* 8197.

9. **Clematopsis trifida,** *Hutchinson*, comb. nov.

Clematis trifida, Hook. Ic. Pl. t. 79 (1837).

Madagascar. Grassy hills between Imbositra and Itsimatorhedolana, 19 Dec. 1894, *Dr. Forsyth Major* 714. East Imerina; Andrangoloaka, on hills, flowers milky white, Nov. 1880, *J. M. Hildebrandt* 3687. Central Madagascar, *Rev. R. Baron* 690, 1817. Without definite locality, *Dr. Lyall* (type).

10. **Clematopsis scabiosifolia,** *Hutchinson*, comb. nov.

Clematis scabiosifolia, DC. Syst. i. 154 (1818). *Clematis villosa*, var. *scabiosifolia*, O. Kuntze, Monogr. Clemat. 174 (1885); Hiern in Cat. Afr. Pl. Welw. i. 2 (1896).

Tropical Africa. Angola: Huilla; very abundant and variable, near Lopollo in hot wooded stations, especially in ornamental woods composed of *Strychnos* and *Proteaceae*, fls. Jan., fr. Apr. 1860, *Welwitsch* 1221. South Angola; in thickets near meallie fields on plateau near Humpata, on the way from Limekiln, 1800 m., 4 May, 1909, sepals white, *H. H. W. Pearson* 2629;

near Limekiln, common along edges of meallie field, 1800 m., young fr. 4 May 1909, *H. H. W. Pearson* 2624. Cunene passage, 5 ft. high, in open thickets, fl. 12–2-07. *Gossweiler* 2881.

11. **Clematopsis Stanleyi,** *Hutchinson*, comb. nov.

Clematis Stanleyi, Hook. Ic. Pl. t. 589 (1843); Harv. in Harv. & Sond. Fl. Cap. i. 3 (1859); Watson in Gard. Chron. 1890, ii. 326; Garden & Forest, ii. 513, fig. 65 (1890); Hook. f. Bot. Mag. t. 7166 (1891).

South Africa. Transvaal: Macalisberg, Dec., *Burke* (type). Springbokolakte, Klipfontein, *W. Nelson* 275. Wonderfontein district, *W. Nelson* 344. Between Broukhorstspruit and Middelburg, Dec. 1883, *F. Wilms* 3. Sandy places near Sandfontein, 1320 m., fr. 14 April 1894, *R. Schlechter* 4784. Fields near Doekerhoek, 1560 m., 4 Jan. 1894, *R. Schlechter* 4133. Kuduspoort, Pretoria, *A. Rehmann* 4661. Wonderboompoort, Pretoria, *A. Rehmann* 4590. Without definite locality; *Sanderson*; *Zeyher* 3.

Tropical Africa. Rhodesia: Leshumo valley and forest, Jan. 1876, *Dr. E. Holub*. Near Chirinda, 1050 m., Oct. 1907, *C. F. M. Swynnerton* 358. Batoka Plateau, Feb., small shrub 2–3 ft. high, *C. E. F. Allen* 508. Gweloe on the veldt, Jan. 1905, *T. Gardner* 9. Matabeleland: hills near Selukwe, 1½-2 ft. high, fls. white, tinted with pink, stamens greenish-yellow, Nov. and Dec. 1899, *Hon. Mrs. Evelyn Cecil* 119. "South African Goldfields," 1870, *T. Baines*. Angola: Huilla; near Lopollo, *Welwitsch* 1221 b.

There is a beautiful figure of this species (as *Clematis Stanleyi*), in the Botanical Magazine t. 7166 (1891), and the late Sir Joseph Hooker therein gave some highly interesting notes which support our theory on the connection of *Clematopsis* with *Clematis* and *Anemone*. Hooker says "Few genera of plants present such remarkable divergences in habit and flowers as *Clematis*, and the subject of the present plate shows, perhaps, in this respect the greatest departure from the prevalent characters of its congeners. In fact it most resembles an *Anemone* in foliage and flowers, though no species of that genus has so shrubby a habit. Mr. Watson, indeed, informs me that as grown at Kew *the leaves are sometimes alternate*, a singular fact, which if confirmed,* would leave nothing whereby to distinguish the two genera from one another but the valvate petals [=sepals] of *Clematis*, these being imbricate in *Anemone*." If the reader turns to this plate in the Botanical Magazine, however, he will see at a glance that the same plant of which Sir Joseph was speaking has widely imbricate sepals.

The fact that under cultivation *Clematopsis Stanleyi* may produce *alternate* leaves and thus become almost a true *Anemone* is highly significant in pointing out its origin from the genus *Anemone*. I say "almost a true *Anemone*," for the aestivation of the sepals of *C. Stanleyi* (see diagram no. 3) is very peculiar,

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* Mr. Coutts has shown me several pots of *C. Stanleyi* at Kew, in many of which the leaves are alternate.

and is a very graphic example of the way in which *valvation* may have arisen from *imbrication*. Such an aestivation, I think, will not be found in *Anemone* proper.

On the climatic conditions under which *Clematopsis Stanleyi* grows Mr. E. E. Galpin wrote to Kew in July, 1890, as follows: "*Clematis* [=*Clematopsis*] *Stanleyi*, like so many of the smaller plants here, dies down to the roots in the winter. It has turned very cold and was freezing in the night, and at 3 o'clock this afternoon the temperature had not gone above 39° Fahr., which is scarcely what an outsider would expect in a subtropical place like Barberton."

The specimens from Tropical Africa quoted above are included with some reservation; their leaf-segments are mainly broader and less hairy than in typical *C. Stanleyi* from the Transvaal.

12. **Clematopsis oligophylla,** *Hutchinson*, comb. nov.

Clematis oligophylla, Hook. Ic. Pl. t. 80 (1837). *C. villosa*, subsp. *oligophylla*, O. Kuntze, Monogr. Clemat. 173 (1885).

MADAGASCAR. Mountains of Emirra Province, *Bojer*. North East of Ankaratra Mts., *Langley Kitching*. "Central Madagascar," *Rev. R. Baron* 1766, 1817.

13. **Clematopsis anethifolia,** *Bojer ex Hook.* Ic. Pl. sub. t. 78 (1837), nomen.

Clematis anethifolia, Hook. l.c. t. 78. *C. villosa*, subsp. *anethifolia*, O. Kuntze, Monogr. Clemat. 174 (1885).

MADAGASCAR. *Dr. Lyall* 109. Central region, *Rev. R. Baron*. Very abundant on rather dry ground, Arivorarnano, young fr. Jan., *Scott Elliot* 1926.

14. **Clematopsis pimpinellifolia,** *Bojer ex Hook.* Ic. Pl. sub. t. 77, nomen (1837).

Clematis pimpinellifolia, Hook. l.c. t. 77. *C. villosa*, subsp. *pimpinellifolia*, O. Kuntze, Monogr. Clemat. 173 (1885).

MADAGASCAR. In fruit, *Dr. Lyall* 108. Central region, *Rev. R. Baron*, 690, 2004. North Betsileo, Loherano, flowers milky white, Jan. 1881, *J. M. Hildebrandt* 3877.

15. **Clematopsis villosa,** *Hutchinson*, comb. nov.

Clematis villosa, DC. Syst. 154 (1818); *C. villosa*, var. *normalis* forma *Bojeri*, O. Kuntze, Monogr. Clemat. 173 (1885). *Clematopsis suaveolens*, Bojer ex Hook. Ic. Pl. sub. t. 10 (1837). nomen. *Clematis Bojeri*, Hook. l.c. t. 10.

MADAGASCAR. *Dr. Lyall*. 61 (type) Central region, *Rev. R. Baron* 690. North Betsileo; Loherano, flowers milky white, Jan. 1881, *J. M. Hildebrandt* 3877a. Dry ditch in long grass at foot of Andringitra Mt., Jan., *Scott Elliott* 1824. Without definite locality, *Bojer*.

I accept here O. Kuntze's determination of De Candolle's *Clematis villosa*, formerly supposed to have come from India. I have not seen the type specimen, which is in Paris.

IV.—DIAGNOSES AFRICANAE: LXXIII.

1641. **Acmadenia teretifolia,** *Phillips*, comb. nov. [Rutaceae-Diosmeae]; affinis *A. macrostylidioidei*, Schlechter, sed foliis confertis majoribus subteretibus hispidulis differt.

Frutex depressus, lignosus, circiter 0·5 m. altus; ramuli foliorum vestigiis asperati, minute pubescentes. *Folia* subsessilia, subteretia, supra canaliculata, apice obtusa, 3-5 mm. longa, 1 mm. crassa, hispidula, viscida et glandulosa; petioli 0·5-1 mm. longi. *Flores* sessiles, terminales, 2–4-nati; bracteae clavatae, obtusae, 2–3 mm. longae, hispidulae. *Sepala* spathulata, obtusa, 3–4 mm. longa, hirsuta, marginibus membranaceis ciliatis. *Petala* breviter unguiculata, elliptica vel suborbiculata, apice obtusa, 6–6·5 mm. longa, extra pubescentia, ciliolata, ungue oblongo 1–1·5 mm. longo 0·75 mm. lato. *Filamenta* 1 mm. longa, subteretia, glabra; antherae 1 mm. longae, ellipsoideae, apice glandulo parvo sphaerico coronatae. *Staminodia* glanduliformia, 0·25 mm. longa. *Ovarium* sphaericum, 1 mm. diametro, superne pubescens; stylus 1 mm. longus, curvatus, teres, glaber, stigmate capitato. *Fructus* 4 mm. longus, 5 mm. latus, valvis costatis.

Diosma teretifolia, Link, Enum. 237; Sond. in Harv. & Sond. Fl. Cap. i. 376.

South Africa. Clanwilliam Div.: Sneeuwkop Mountain, *Liepoldt* 651. Ceres Div.: Cold Bokkeveld, near Ceres, about 2000 m., *Schlechter* 10098; Gydouw, near Ceres, Dec., *Bolus* 7576. Worcester Div.: Matroosberg, about 2400 m., Jan., *A. Bolus in Herb. H. Bolus* 6360; *Phillips in Herb. Mus. Austr.-Afric.* 11768. Tulbagh Div.: Great Winterhoek, *A. Bolus in Herb. Guthrie* 4188 (partim).

(The following additional records are in the Kew Herbarium:—Worcester Div.: Dutoits Kloof, 600–900 m., Oct.–Jan., *Drège*. Swellendam Div.: Summit of a mountain peak near Swellendam, Jan., *Burchell* 7349).—Ed.

Var. **glabrata,** *Phillips;* a typo ramulis foliisque glabris differt —*Diosma teretifolia*, var. *glabrata*, Sond. l.c.

South Africa. Worcester Div.: Matroosberg, 1650 m., *A. Bolus in Herb. Guthrie* 3968: about 1950 m., *Marloth* 2343. Tulbagh Div.: Great Winterhoek, *A. Bolus in Herb. Guthrie* 4188 (partim).

This species was described by Link as a *Diosma* (*D. teretifolia*), and retained as such by Sonder in the *Flora Capensis*, but on account of the clawed petals and the presence of staminodes it would appear better placed in *Acmadenia*. The Director of Kew was good enough to compare specimens with the Kew material and reports them to be identical with *Diosma teretifolia*, Link.

In both the Great Winterholk and the Matroosberg a glabrous form with shiny leaves is found.

1642. **Craterispermum caudatum,** *Hutchinson* [Rubiaceae-Vanguerieae]; affinis *C. montano*, Hiern, sed foliis caudato-acuminatis fructibus longe pedicellatis differt.

Arbor parva (Aylmer); ramuli sicco laete virides, subangulares, glabri, internodiis 2–3 cm. longis. *Folia* oblonga vel oblongo-elliptica, basi breviter cuneata, apice longe et acute caudato-acuminata, 8-14 cm. longa, 2·5–4·5 cm. lata, tenuiter chartacea, utrinque sublaxe reticulata, glabra, sicco pallide viridia; costa supra impressa, infra prominens, straminea; nervi laterales utrinsecus circiter 8, a costa sub angulo fere recto abeuntes, prope marginem conjuncti, gracillimi; petioli 5–6 mm. longi, supra canaliculati; stipulae cupulatae, caudato-acuminate, 3–4 mm. longae, margine setoso-ciliatae. *Pedunculi* supra-axillares, circiter 6 mm. longi, complanati (fere alati), glabri. *Flores* pauci, dense capitati; bracteae binae, oppositae, triangulari-lanceolatae, acutae, 2 mm. longae, parce ciliatae; bracteae breviter cupulate, minute ciliolatae. *Receptaculum* late obconicum, 1·25 mm. longum, minute-puberulum. *Calyx* 0·65 mm. longus, minute 5-denticulatus et ciliolatus. *Corollae tubus* 4 mm. longus, extra glaber, intra parce pilosus; lobi 5, oblongi, intra breviter cucullati, 2·5 mm. longi, 1·5 mm. lati, intra glabri. *Stamina* exserta; filamenta 2 mm. longa; antherae 1 mm. longae, versatiles, leviter curvatae. *Stylus* gracilis, 3 mm. longus, glaber, stigmate lobulato. *Fructus* globosus, 3 mm. diametro, minute puberulus, pedicellis fructiferis 4 mm. longis.

Tropical Africa. Sierra Leone: Bandajuma, small tree, 10 May, 1914, "Newerri" (Mendi), *G. Aylmer* 78 (type); near Likuru, Talla Hills, Feb. 23, 1892, *G. F. Scott Elliot* 4987; Kenema, Jan. 28, 1915, *N. W. Thomas* 7857, 7891, 7946.

This distinct species may be at once recognised by its small closely capitate inflorescences, the long-pedicellate subumbellate fruits, and the oblong long-caudate leaves.

1643. **Senecio Snowdenii,** *Hutchinson* [Compositae-Senecionideae]; affinis *S. Schultzii*, Hochst., sed planta ubique breviter et dense glandulosa, foliis marginibus minute crenulatis et recurvatis, capitulis anguste campanulatis bracteis paucioribus differt.

Herba usque ad 0·75 m. alta, erecta, ubique dense glandulosa; caulis subsimplex vel parce ramosus. *Folia* numerosa, mox abrupte reflexa, linearia, apice obtusa et cartilagineo-incrassata, basi semiamplexicaulia, 5–6 cm. longa, 5-9 mm. lata, marginibus obtuse crenulatis late recurvatis, utrinque pilis glandulosis dense induta. *Capitula* solitaria, terminalia, vel pauca et laxe corymbosa; pedunculi circiter 2 cm. longi, foliis bracteiformibus paucis ornati. *Involucri bracteae* circiter 14, crassae, extra dense glandulosae, marginibus abrupte membranaceis, circiter 1 cm. longae et 0·75 mm. latae. *Flores radii* 4 cm. expansi, flavi; corollae tubus cylindricus, 6 mm. longus, glaber; lamina lineari-oblonga, apice rotundata, 1·5-2 cm. longa, 5 mm. lata, 4-nervia; pappus albus, tubo parum longior. *Flores disci*: corollae tubus 8 mm. longus, superne sensim latior; lobi 5, obtuse triangulares, 0·75 mm. longi; pappus corollae tubo aequilongus. *Achaenia* parce puberula.

Tropical Africa. Uganda: Mt. Elgon, herb in short grassland, 3600–3900 m., 22 Oct., 1916, *J. D. Snowden* 463.

Named in compliment to Mr. J. D. Snowden, District Agricultural Officer, Uganda Protectorate, who has collected several interesting novelties in the temperate zone of Mt. Elgon.

1644. **Mostuea amabilis,** *Turrill* [Loganiaceae]; species *M. syringaeflorae*, S. Moore, affinis sed foliis minoribus, calycis lobis minus ciliatis, corollis campanulatis praecipue differt.

Frutex parvus, 3-6 dm. altus (ex collectore), ramis glabris vel junioribus adpresse pubescentibus teretibus. *Folia* elliptica vel elliptico-ovata, apice obtusa, rotundata vel leviter emarginata, basi in petiolum pubescentem vix 1 mm. longum abrupte angustata, usque ad 1·7 cm. longa et 1·1 cm. lata, margine forte plus minusve undulata, nervatione utrinque sub-prominente, supra viridia, costa hirsuta excepta glabra, infra pallide viridia, costa et nervis principalibus leviter hirsutis; stipulae interpetiolares 2·5 cm. longae, in dimidio inferiore late vaginatae, superiore aciculares. *Inflorescentiae* axillares vel terminales 3–4-florae; bracteae minutae; pedunculus 5·7 mm. longus, gracilis, glaber; pedicelli usque ad 7 mm. longi, graciles, glabri. *Calyx* 5-lobatus, lobis oblongo-ovatis 1·5 mm. longis 1 mm. latis apice obtusis margine ciliolatis. *Corolla* campanulata, 1 cm. longa, diametro basi 1·3 mm., fauce 4·5 mm., aurantiaca (in siccitate), lobis late ovatis 3·5 mm. longis 4 mm. latis margine minutissime ciliolatis. *Stamina* 5, subaequalia, filamentis 5·5 mm. longis leviter glandulosis. *Ovarium* subcylindricum, 1·5 mm. altum, 0·5 mm. diametro, apicem versus hirsutum; styli 2 mm. longi.

Tropical Africa. Portuguese East Africa: near the mouth of the Musalu River, fl. Dec., *C. E. F. Allen* 90.

1645. **Thunbergia** (**Euthunbergia**) **prostrata,** *Turrill* [Acanthaceae-Thunbergieae]; *T. primulinae*, Hemsl., affinis sed foliis latioribus, floribus longe pedunculatis minoribus praecipue differt.

Herba gracilis, prostrata, caulibus teretibus, leviter pubescentibus. *Folia* late ovata, apice obtusa vel subacuta, basi saepe obliqua, plus minusve truncata vel subcordata vel cuneata, petiolo 7 mm. incluso usque ad 5·2 cm. longa et 5·5 cm. lata, utrinque leviter pubescentia, margine ciliata, costa et nervis pagina inferiore prominentibus, superiore basi excepta impressis. *Flores* in foliorum axillis solitarii, pedunculo 8 cm. longo asperopubescente; bracteae oblique ovatae, apice acutae, basi cordatae, 2·5 cm. longae, 1·5 cm. latae, nervis parallelis 7–9 prominentibus, extra pubescentes, intus glabrae. *Corollae* tubus cylindricus, arcutus, 1·6 cm. longus, 3 mm. supra basem leviter constrictus et intus in annulo duplici leviter puberulus, basi 3·5 mm. diametro fauce 5 mm. diametro; lobi 5, inter se subaequales, 8 mm. longi, 1 cm. lati, flavi. *Stamina* 4, filamentis duobus 6 mm. longis, duobus 3·5 mm. longis, basi pubescentibus; antherae 3 mm. longae, thecis subaequalibus calcaratis; pollinis granula sphaeroidea, 95 μ diametro. *Discus* annularis, inconspicuus. *Ovarium* ovoideum, bilateraliter compressum, 3 mm. altum, 2·5 mm. diametro,

glabrum; stylus cum stigmate 2·5 mm. longo bilabiato lobis aequalibus rotundatis 1·1 cm. longus.

Tropical Africa. British East Africa: Common on exposed grasslands, 2150–2460 m.; grown at Kew from seeds collected and communicated by *E. Battiscombe.*

It is said to be a prostrate herb, growing where there is abundant rainfall, amongst grass, and never climbing.

1646. **Asystasia amoena,** *Turrill* [Acanthaceae-Justicieae]; *A. Colae,* Rolfe, affinis sed foliis lanceolato-ellipticis majoribus, bracteolis calyce brevioribus, corollis majoribus facile distinguitur.

Herba erecta, caulibus teretibus patenter hirsutis. *Folia* lanceolato-elliptica, apice acuminata, basi gradatim angustata, usque ad 1·4 dm. longa, 3·5 cm. lata, costa nervisque pagina superiore subprominentibus, inferiore prominentibus, nervis lateralibus utrinque circiter 6, costa nervisque infra leviter hirsutis, alioqui glabra; petiolus circiter 1 cm longus, hirsutus. *Inflorescentia* terminalis, patule hirsuta, usque ad 1·8 dm. longa; bracteae lineares vel lineari-lanceolatae, 0·6–3·5 cm. longae, plus minusve hirsutae; pedicelli 0·8–2 cm. longi, patule hirsuti; bracteolae late ellipticae, apice obtusae, 1·2 cm. longae, 9 mm. latae, fere 3 mm. infra apicem positae, dorso hirsutae, intus glabrae. *Calyx* 5-fidus, segmentis subaequalibus anguste elliptico-lanceolatis apice subacutis 1·5–2 cm. longis utrinque glandulosis. *Corolla* late infundibuliformis, 3·5 cm. longa, basi 2 mm. diametro, 2 mm. supra basem dilatata et 3·3 mm. diametro, 7 mm. supra basem constricta et intus pilorum annulo praedita, alioqui glabra, fauce 8 mm. diametro, lobis 5 fere aequalibus oblongis obtusis vix 1 cm. longis 4 mm. latis. *Stamina* 4, glabra, filamentis 2·3 cm. lougis, antheris 4 mm. longis thecis 2 parallelis instructis; pollinis granula breviter ellipsoidea circiter 56 μ longa et 48 μ diametro. *Discus* annularis, 1 mm. altus, glaber. *Ovarium* obovoideum, 2·5 mm. altum, 2 mm. diametro, glabrum; stylus 2·9 cm. longus, apice breviter bifidus, superne leviter hirsutus praeterea glaber. *Capsula* spathulata, 2·2 cm. longa, 9 mm. lata, glabra. *Semina* 4, plana, fere orbicularia, 7–8 mm. diametro, rugosa, flava.

Tropical Africa. Sierra Leone: undergrowth in Rain Forest; common round York Pass, *Lane-Poole* 180.

1647. **Leucadendron uniflorum,** *Phillips* [Proteaceae-Proteae]; species capitulis ♀ unifloris distinctissima.

Suffrutex 1·2 m. altus. *Rami* et ramuli glabri vel pubescentes. *Folia* 1–2·6 cm. longa, linearia, apice obtusa, basi angustata, glabra. *Inflorescentia* ♂ pedunculata, terminalis, 6 mm. longa, 4 mm. lata; pedunculus 1 cm. longus. *Bracteae* 2·5–3 mm. longae, ovatae vel lineares apice obtusae, pilosae. *Perianthii tubus* 3 mm. longus, cylindricus, villosus; segmenta 1 mm. longa, pubescentia; lobi 2·5 mm. longi, lineari-lanceolati, apice obtusi, pubescentes. *Antherae* 2 mm. longae, lineares. *Stylus* 1·5 mm. longus, glaber; stigma 2 mm. longum, clavatum. *Inflorescentia* ♀ uniflora, sessilis, 1 cm. longa, 7 mm. lata. *Bracteae* 4·5–9 mm.

longae, 4–6 mm. latae, concavae, ovatae, vel ovato-lanceolatae, apice obtusae, aliquando acuminatae, villosae. *Perianthii tubus* 9 mm. longus, villosus; segmenta 4 mm. longa, linearia, villosa; limbus 3 mm. longus, linearis, apice obtusus. *Staminodia* 2·5 m. longa. *Ovarium* 2 mm. longum, 1 mm. latum, globosum, villosum; **stylus 8 mm. longus, glaber.**

A shrub 1·2 m. high with 7–12 branchlets 12–19 cm. long arranged in a whorl on the branches, which are produced 24–26 cm. beyond the whorl and bear the inflorescences. *Branches* and branchlets glabrous or very finely pubescent. *Leaves* similar in both sexes, 1–2·6 cm. long, linear, obtuse, narrowed to the base, glabrous; when boiled out the leaves appear rough which is due to striations in the walls of the epidermal cells.* *Male* inflorescence peduncled, terminal on short axillary shoots; peduncle surrounded by the upper leaves, 1 cm. long, bracteate; head 6 mm. long, 4 mm. in diameter, few flowered. *Flowers* in the axils of bracts. *Bracts* 2·5–3 mm. long, obtuse; finely pilose on the upper half; the outer 1·5 mm. broad, ovate; the inner 1 mm. broad linear. *Perianth-tube* 3 mm. long, cylindric, villous; segments 1 mm. long, pubescent; limb 2·5 mm. long, linear-lanceolate, obtuse, pubescent with glabrescent tips. *Anthers* 2 mm. long, linear. *Style* arising from apex of perianth-tube, 1·5 mm. long, cylindric, glabrous; stigma 2 mm. long, somewhat clavate, minutely bifid at the apex. *Female inflorescence* terminal on short axillary shoots, one-flowered, sessile, 1 cm. long, 7 mm. broad at the base, surrounded by the upper leaves. *Outer bracts* 4·5–7 mm. long, 4–6 mm. broad, concave, ovate, obtuse, some shortly and bluntly acuminate, villous with white hairs; inner bracts 9 mm. long, concave, ovate to ovate-lanceolate, obtuse, villous. *Perianth-tube* 9 mm. long, densely villous, segments 4 mm. long, linear, villous; limb 3 mm. long, linear, obtuse. *Staminodes* 2·5 mm. long. *Ovary* 2 mm. long, 1 mm. in diameter, globose, densely villous; style 8 mm. long, cylindric, glabrous; stigma not seen.

South Africa. Riversdale Division: Muiskraal, near Garcia's Pass, about 320 m., October, *Galpin* 4441, 4442 (and *in National Herbarium*, Union of South Africa 800, 801).

This species approaches *L. corymbosum*, Berg., in habit but differs in having the male inflorescence pedunculate; also allied to *L. ericifolium*, R. Br., but differs in the longer and thicker leaves, and by the fleshy glabrous or almost glabrous male bracts.

1648. **Phyllanthus asperulatus,** *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *P. Niruri*, Linn., sed ramulis asperulatis disco ♀ minus lobato differt.

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* Mr. Boodle has examined these leaves and makes the following observations:—

"In a transverse section of a leaf, the cuticle appears slightly warted. This is due to longitudinal cuticular ridges, of which there are usually three or four over each epidermal cell, extending for the greater part of the length of the cell.

A soaked leaf has a rather white appearance owing to reflection of light from a substance occupying the cavities of the epidermal cells, and having sphaerocrystalline structure."

Planta annua, circiter 2·5 dm. alta, in parte superiore tertia ramosa; caulis inferne nudus, stramineus, minute et parce scabrido-puberulus; ramuli foliati, compresso-angulares, marginibus minute asperulati. *Folia* oblongo-elliptica, utrinque rotundata, 0·8–1·2 cm. longa, 4–8 mm. lata, membranacea, glabra, sicco glauco-viridia; nervi laterales utrinsecus 5–6, supra vix evidentes, infra satis prominuli; petioli graciles, circiter 1 mm. longi; stipulae subulato-lanceolatae, acutae, membranaceae, 1 mm. longae. *Flores* monoici, ♂ in parte inferiore, ♀ in parte superiore ramulorum dispositi. *Pedicelli* ♂ brevissimi; sepala 6. obovata, apice rotundata, 1 mm. longa, 1-nervia, membranacea, hyalina, glabra; disci glandulae 6, planae, rotundatae, laeves; stamina 3, filamentis brevissimis in columnam connatis, antheris transverse dehiscentibus. *Flores* ♀ brevissime pedicellati; sepala 6, subacuta, membranacea, viridescentia, marginibus hyalinis, glabra. *Ovarium* laeve, stylis brevibus e basi patentibus apicibus incrassatis bifidis. *Capsula* mox dehiscens, integra non visa, parietibus crustaceis tenuissimis. *Semina* triquetra, dorso convexa, crebre et longitudinaliter sulcata.

South Africa. Kalahari Region: Transvaal; Komati Poort, 320 m., Dec., *Schlechter* 11866.

1649. **Phyllanthus delagoensis,** *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *P. heterophyllo*, Muell. Arg., sed stigmatibus subintegris et subsessilibus, foliis minimis dense dispositis differt.

Caules ut videtur e rhizomate lignoso orti, e basi ramosi, sulcati, glabri; ramuli satis foliati. *Folia* late elliptica vel oblongo-elliptica, utrinque obtusa, 3–4·5 mm. longa, 1–2·5 mm. lata, subcoriacea, glabra; stipulae subulatae, membranaceae. *Flores* monoici, masculi in ramulorum parte superiore, foemini in parte inferiore dispositi. *Pedicelli* ♂ breves et graciles; sepala 6, inaequalia, lanceolata, subacuta, usque ad 1 mm. longa, glabra; disci glandulae minimae et rotundatae, laeves; stamina 3; filamenta breviter connata; antherae magnae, transverse dehiscentes. *Pedicelli* ♀ 1–1·5 mm. longi; sepala 6, quam ♂ majora et subaequalia; discus patelliformis, leviter undulatus, carnosus, glaber; stigmata subintegra et fere sessilia; capsula et semina non visa.

South Africa. Eastern Region: Delagoa Bay; Lorenzo Marques, *R. Schlechter* 11663.

1650. **Isachne angusta,** *Stapf* [Gramineae-Paniceae]; spiculis hiantibus versus apices paniculae ramorum congestis et glumis angustis facile distinctu.

Perennis, laxe caespitosa, ad 25 cm. alta, rhizomate gracili, innovationibus extravaginalibus, gemmis cataphyllis tenuibus pubescentibus obtectis. *Culmi* pergraciles, geniculato-ascendentes, teretes, florentes 4–7, steriles, plerumque plurinodi, internodiis magis minusve exsertis superne adpresse pubescentibus. *Foliorum* vaginae arctae, tenuiter pubescentes et ad margines dense ciliatae; ligulae ad marginem breviter ciliatum reductae; laminae lanceolatae, acutae, basi subrotundatae,

1·5–3 cm. longae, 3–6 mm. latae, planae, patentes, rigidulae, subglaucae, glabrae, laeves vel sublaeves, nervis permultis tenuissimis, primariis subtus utrinque circiter 3 subdistinctis. *Paniculae* longe e summa vagina exsertae, ambitu ovatae, 1·5–4 cm. longae, graciles, glabrae; rami primarii obliqui, infimi ad 2–1 cm. longi, ad medium indivisi, abhinc in racemum basi saepe compositum contractum abeuntes; pedicelli inferiores 3–4 mm. longi, summi et racemulorum laterales multo breviores. *Spiculae* hiantes 1·75 mm. longae, pallide vel glauco-virides; rhachillae internodia brevissima, sed distincta. *Glumae* aequales, oblongae, 1–5 mm. longae, subacutae vel obtusiusculae, scaberulae. *Anthoecium inferum* ♂ oblongum, subobtusum: valva tenuiter 5-nervis, pallida, tenuiter chartacea; valvula structura valvae; lodiculae tenuissimae capillaribus, plerumque. *Antherae* filamentis inter stigmatis pilos retentae, 0·25 mm. longae. *Anthoecium superum* ♀, intero applicatum et id paulo excendens, ei simillimum; lodiculae ut videtur 0; stamina ad staminodia minuta vix 0·2 mm. longa clavata redacta.

Bourbon. Without precise locality, *Balfour*.

V.—THE REV. H. F. TOZER AND PLANTS COLLECTED BY HIM IN THE NEARER EAST.

W. B. Turrill.

Amongst a collection of dried plants recently presented to Kew by Miss E. M. Wakefield were found a number of specimens collected in the Balkans and Orient by the Rev. H. F. Tozer. Some of these come from localities which have been very little visited by botanists, such as the Scardus (Shar Dagh or Shar Planina) and Pindus Ranges and Mt. Olympus in Lesbos (Mitylene).

The Rev. H. F. Tozer, M.A., F.R.G.S., was born at Plymouth in 1829 and died at Oxford on 2nd June, 1916. He became a Fellow of Exeter College in 1893 and was a well-known figure in Oxford. He travelled extensively in Europe and the Orient, especially in Greece and the old Turkish Empire. Numerous journeys were made to these interesting regions and many mountain ranges and peaks were climbed. His most noteworthy ascent was that of Mount Argaeus, the highest summit of Asia Minor. His chief works dealing largely with the Nearer East are: "The Highlands of Turkey," 2 vols., 1869; "Lectures on the Geography of Greece," 1873; "Primer of Classical Geography," 1877; Turkish Armenia and Eastern Asia Minor," 1881; "The Church and the Eastern Empire," 1888; "The Islands of the Aegean," 1890; and "History of Ancient Geography," 1897. He edited Finlay's "History of Greece," 1877, and Wordworth's "Greece," 1882, and was also the author of the following articles in the Encyclopædia Britannica, ed. 11: Attica; Euboea; Santorin; Thessaly; Thrace and Trebizond. An

obituary notice of him was published in the Geogr. Journ., vol. 48, p. 176 (Aug. 1916).

The writer desires to thank Dr. G. C. Druce, M.A., F.L.S., and Mr. C. H. Wright, A.L.S., for assistance in tracing the above particulars.

Systematic List of Plants collected by The Rev. H. F. Tozer in the Balkans and Orient.

Ranunculus Villarsii, DC. (R. oreophilus, *M.B.*). Macedonia: Scardus, 1865.

Nigella Damascena, L. Greece: Corinth; Isthmus.

Delphinium orientale, J. Gay. Macedonia: Chalcidice, 1861.

Glaucium flavum, Cr. Macedonia: shores of Athos.

Capparis sicula, Duh. Greece: Euboea, Chalcis.

Dianthus erinaceus, Boiss., var *alpinus*, Boiss. Anatolia: Mt. Ida, 1861.

Dianthus hæmatocalyx, Boiss. et Heldr. Thessaly; Mt. Olympus, 1865.

Dianthus deltoides, L. Macedonia: Scardus, 1865.

Cerastium alpinum, L. Macedonia: Scardus, 1865.

Hypericum olympicum, L. Anatolia: Mt. Ida.

Hypericum Aucheri, Jaub. et Spach. Anatolia: Mt. Ida.

Geranium subcaulescens, L'Her. Macedonia; Scardus, 1865.

Trifolium pratense, L. var. *rumelicum*, Vel. Macedonia: Scardus.

Anthyllis Vulneraria, L. var. *Dillenii*, Schult. Thessaly: Mt. Olympus, 1865.

Anthyllis aurea, Host. Thessaly: Mt. Olympus, 1865.

Astragalus cephalonicus, Presl. Greece: Phocis; Peaks of Parnassus.

Lathyrus grandiflorus, Sibth. Macedonia: Athos.

Geum montanum, L. Macedonia: Scardus, 1865.

Geum coccineum. S. et S. Macedonia: Scardus, 1865.

Potentilla ternata, Koch. Macedonia: Scardus, 1865.

Rosa pendulina, L. Macedonia: Pindus, 1861.

Saxifraga chrysoplenifolia, Boiss. Greece: Morea.

Saxifraga Federici-Augusti, Bias. Macedonia: Athos, 1861. Thessaly: Mt. Olympus, 1861.

Saxifraga heucherifolia. Griseb. Macedonia: Scardus, 1865.

Saxifraga sancta, Griseb. Macedonia: Peaks of Athos, 1861.

Saxifraga Sibthorpii, Boiss. Greece: Phocis; Peaks of Parnassus, near the snow, 1861.

Bupleurum odontites, L. Macedonia: Chalcidice (?).

Asperula arcadiensis, Sims. Greece: Achaea; Megaspelion.

Pterocephalus Parnassi, Spreng. Anatolia: Mt. Ida, 1861.

This species is not uncommon in the mountainous districts of Greece and it has also been found on Athos but, so far as the writer knows, has not been previously recorded from Asia Minor. The nearly related *Pterocephalus Pinardi* takes the place of *P. Parnassi* on the mountains of Asia Minor and specimens from Mt. Ida are in the Kew Herbarium. Both species appear to meet on this mountain massif. *P. Pinardi* is distinguished from

P. Parnassi by its laxer caespitose habit, more divided foliage leaves, and narrow and longer involucral leaves.

Centaurea rupestris, L. var. *athoa*, DC. (pr. sp.) Macedonia: Athos, 1861.

Centaurea rupestris, L. var. *hirtella*, Posp. Anatolia: Ida, 1861.

Hieracium Hoppeanum, Schultes. Macedonia: Scardus, 1865.

Campanula oreadum, Boiss. et Heldr. Thessaly: Mt. Olympus, 1865.

Campanula patula, L. Macedonia: Scardus, 1865.

Bruckenthalia spiculiflora, Rchb. Macedonia: Scardus, 1865.

Datura Stramonium, L. Macedonia: Athos, Iveron.

Atropa Belladonna, L. Macedonia: peak of Athos, 1861.

Thymus Serpyllum, L. Macedonia: Scardus, 1865.

Aristolochia Clematitis, L. Macedonia: Chalcidice, near Erisso.

Euphorbia myrsinites, L. Greece: Phocis; Parnassus.

Daphne oleoides, Schreb. var. *glandulosa*, Bert. Macedonia: Mt. Pindus.

Daphne oleoides, Schreb. var. *puberula*, Jaub. et Spach. Greece: Phocis; Mt. Parnassus. Thessaly: Mt. Olympus, 1865.

Orchis papilionacea, L. Lesbos (Mitylene): Pyrrha, 1886.

Scilla bifolia, L. Lesbos (Mitylene): Mt. Olympus, 1886.

Anthericum Liliago, L. Thessaly: Mt. Olympus, within the region of the trees.

Sternbergia lutea, L. Greece: Arcadia; Muchli and Karytena, Sept. 1882.

Sternbergia colchiciflora, W. et K. Macedonia: northern heights of Pindus.

Gagea foliosa, Presl. Lesbos (Mitylene): Mt. Olympus, 1886.

VI.—MISCELLANEOUS NOTES.

Sir William MacGregor.—Best known for his remarkably successful administrative work under the Colonial Office, the Right Hon. Sir William MacGregor, G.C.M.G., whose death took place in Aberdeen on July 3, was distinguished in several ways, and will be remembered not only as a great Governor, but as a medical man, an explorer, and a collector of natural history objects. In the last-named capacity and as the donor of collections made under his direction he became known to Kew about 30 years ago, when specimens of several plants used as foods, etc., in British New Guinea, of which Sir William MacGregor was the first Lieutenant-Governor, were received from him through Sir F. von Mueller, to whom he had previously sent a collection of interesting plants from the New Guinea highlands; of the latter many were new and were described by Mueller in the Transactions of the Royal Society of Victoria, vol. i. pt. 2, pp. 1-45 (1889). Larger collections from New Guinea and the Louisiade Archipelago were received direct from Sir William in 1889-90 and in 1897 and 1899. These included numerous specimens, in many instances of new species, collected on Mount

Scratchley, and on the Wharton Range and in the Vanapa Valley, New Guinea, by A. Giulianetti and A. E. English, of which an account was given in the *Kew Bulletin*, 1899, p. 95. In 1901 and 1902, while Governor of Lagos, Sir William MacGregor contributed three collections to the Herbarium, including 382 specimens collected by T. B. Dawodu. In 1904 he was transferred to Newfoundland, where he remained till 1909, and during this period he personally conducted a scientific expedition to Labrador, the object of which was to fix the longitude of some of the principal points on the coast, to make astronomical, meteorological, hydrographic, and mineralogical investigations, and to collect botanical and zoological specimens. The expedition was a great success. With the assistance of others, and particularly of the Rev. P. Hettasch, of the Moravian Mission, collections of nearly 400 specimens were made and sent to Kew. Enumerations of these were published in the *Kew Bulletin*, 1907, pp. 76–88, and 1908, pp. 135–137. Sir William's last contribution to the Herbarium was a small collection made in Grant Land by Capt. Bartlett, received in May, 1910. His services to botany are commemorated in the names of species of *Hypericum*, *Rubus*, *Gentiana*, *Cyathea*, *Daltonia*, *Ectropothecium* and *Schlotheimia*, the last three being genera of Mosses.

We learn from the interesting notice, with portrait, published in the Aberdeen Grammar School Magazine for October, that Sir William MacGregor was born at Towie, Upper Donside, October 20, 1846, so that at the close of his eventful and extraordinarily useful life he was 72 years of age. Lady MacGregor survived him only a few months, her death having occurred suddenly on December 4.

S. A. S.

Prof. J. W. H. Trail.—The following list of papers, published by the late Prof. J. W. H. Trail, is a supplement to the list already printed in *K.B.*, 1919, p. 381:—

Publications of Professor Trail.

Supplementary List.

The modes of dispersion of the seeds of Scottish wild plants. Perths. Soc. Sci. Proc. 1881–86, pp. 57–63.

The modes of dispersion of the seeds of Scottish wild plants. Scot. Nat. 1881–82, p. 257.

On the occurrence of Monoecious plants of *Mercurialis perennis*. Scot. Nat. 1883–84, p. 96.

On *Doassansia Alismatis*, Cornu, *Entyloma canescens*, Shrot, and *E. Calendulae*, Oud. Scot. Nat. 1883–84, p. 180.

Report on fungi. E. Scot. Union Rpt. 1, p. 55.

Report on plants as subjects or causes of disease. E. Scot. Union Rpt. 1, p. 66.

Report on the fungi of the east of Scotland. E. Scot. Union Proc. 2, p. 32.

Presidential address on the work of the Union. E. Scot. Union Proc. 1886, p. 13.

Report for 1886 on fungi of east of Scotland. E. Scot. Union Proc. 1886, p. 69.

Report for 1888 on fungi of east of Scotland. Scot. Nat. 1887–88, pp. 355–357.

Report for 1887 on the fungi of the east of Scotland. E. Scot. Union Proc. 1888, p. 27.

Unconscious influence of human agency on the flora of Scotland. Gard. Chron. 1889, ser. 3, vol. vi, p. 103.

Report for 1888 on the fungi of the east of Scotland. E. Scot. Union Proc. 1889, p. 37.

The gall-making Diptera of Scotland. E. Scot. Union Proc. 1889, p. 41.

Report for 1889 on the fungi of the east of Scotland. E. Scot Union Proc. 1890, p. 49.

The work of the British Association in 1889 in relation to Scottish Scientific Societies. E. Scot. Union Proc. 1890, p. 68.

The British Association in its relation to local natural history museums. E. Scot. Union Proc. 1891, p. 21.

Report for 1890 on the fungi of the east of Scotland. E. Scot. Union Proc. 1891, p. 39.

Spiders, with a list of Perthshire species. Perths. Soc. Nat. Sci. Trans. & Proc. 1, 1891, p. 207.

Additions to the Flora of Scotland. Inverness Sci. Soc. Trans. iii, 1893, p. 408.

First records of Scottish plants. Ann. Scot. Nat. Hist. 1894, pp. 122–123.

Botanical Notes from Murthly. Perths. Soc. Nat. Sci. Trans. & Proc. ii, 1895, pp. 127–131.

Notes on the Flora of Buchan. Trans. Buchan Field Club, v, 1900, pp. 174–179.

Aliens. Trans. Aberdeen Working Men's Nat. Hist. & Sci. Soc. 1901–06, pp. 203–206.

Additions to Gardens.—Railway and transport difficulties last year continued to interfere with the interchange of material between Kew and other establishments. The total number of separate consignments, large and small, to the Gardens was exactly 300, the more important being the following:—

Edinburgh, Royal Botanic Garden.—Chinese Rhododendrons, *Meconopsis*, 350 packets of seeds collected by Forrest in Yunnan and Szechuan; *Gentiana hexaphylla.*

Singapore Botanic Garden.—3 Wardian cases of Orchids and other plants; various seeds.

Calcutta, Royal Botanic Garden.—370 packets of Himalayan seeds.

Arnold Arboretum (Prof. Sargent).—Various seeds and seedlings of trees and shrubs, including *Cunninghamia Konishii.*

Loanda Botanic Garden, Angola.—Various seeds, including *Trichoscypha* sp., "a distinct and ornamental palm," from Portuguese Congo, Raphia sp. and *Enneapogon mollis.*

Washington, Department of Agriculture.—Various plants and seeds, including new species of *Cactaceæ.*

Somaliland, British (the Secretariat).—Seeds of "Yebb," *Cordeauxia edulis*, for distribution.

Melbourne Botanic Garden.—Bulbs of hybrid Watsonias.

Hong Kong Botanic Garden.—Seeds of *Paulownia Fortunei*.

Royal Horticultural Society.—Seeds of *Stevia Rebaudiana*.

Trinidad, Royal Botanic Garden. — Wardian case of plants, *Hibiscus* hybrids.

Pretoria Botanical Department (Dr. I. B. Pole-Evans).—Seeds and plants of new or rare succulents, including *Pachypodium Sealii*, *Commiphora* sp. and *Trichocaulon cactiforme*.

Khartoum Palace Garden (F. Sillitoe).—Seeds and bulbs.

Virgin Islands Experimental Station.—Seeds of *Thrinax Morrisii*, *Mamillaria nivosa*; Yams, etc.

Zionist Commission, Palestine.—Various bulbs and corms.

Dehra Dun, Forest Research Institute (B. B. Osmaston).—Seeds of *Strobilanthes atropurpureus* and *S. Wallichii*.

Glasnevin Royal Botanic Garden.—Various plants and seeds.

Liverpool Botanic Garden.—Various stove plants and orchids.

Mr. G. W. E. Loder, Wakehurst Place.—Various trees and shrubs, 150 packets of Chinese seeds, *Hanasbusaya asiatica*.

Mr. E. H. Wilson, Korea.—Seeds, *Taiwania cryptomeriodes*, from Formosa.

Mr. J. C. Williams, Caerhays Castle.—Many packets of Chinese seeds.

Mr. S. Morris, Norwich.—Collection of seedling Montbretias.

Hon. Vicary Gibbs, Aldenham.—Plants and cuttings of trees and shrubs, including *Castanopsis hystrix*.

Sir Arthur Hort, Bt., Harrow.—Seeds of Chinese Primulas.

Mr. H. A. Moore, Saintfield.—Six *Rhododendron callimorphum*, *Picea morindoides*, etc.

Mr. H. J. Elwes, Colesborne.—55 packets of Chinese seeds.

Lady Hanbury, La Mortola.—Collection of seeds, including *Jubaea spectabilis*.

Mr. C. H. Percival, Morpeth.—*Habenari-orchis viridimaculata*.

Mr. J. Hudson, Gunnersbury.—*Amaryllis Parkeri* × *Crinum*, and *Amaryllis Parkeri* × *Clivia*.

Mr. E. D. Sturtevant, California.—*Beaumontia fragrans*.

Mr. O. N. Badewell, Streatham.—Collection of seeds from Yemen, Arabia.

Dr. A. Henry, Dublin.—Seeds, *Glyptostrobus heterophyllus*.

Lady Pentland, Hereford Square.—*Lilium neilgherrense*.

Sir Alex. Hosie, Sandown.—Seeds of *Pinus Armandii* from Yunnan.

Messrs. F. Sander and Sons, St. Albans.—"Xerophytes from the mountains in Central Madagascar"—? *Pachypodium* sp.

Mr. A. Gosling, Paraguay.—Seeds of *Steria Rebaudiana*.

Mr. G. W. Parsons, Basingstoke.—*Arundinaria tessellata*.

Messrs. Boustead and Co., Leadenhall Street.—Seeds from Brazil.

Mr. E. Frosio, Uruguay.—Seeds of *Pouteria Frosiana*.

Major L. de Rothschild, St. Swithin's Lane.—Collections of seeds from China.

Mr. C. H. Lankester, Costa Rica.—Orchids and Bromeliads.

Mr. R. M. Parker, Conservator of Forests, Chamba State.—Seeds, *Astragalus sukiensis*, *Ulmus Wallichiana*, *Morus serrata*.

Sir George Holford, Westonbirt.—Hybrid Cymbidiums.

Hon. N. C. Rothschild, Oundle.—Orchids from New Guinea.

Mr. E. Brown, Uganda.—*Pancratium trianthum*, various Orchids.

Mr. A. K. Bulley, Neston.—Seeds of *Nomocharis pardanthina*.

Mr. R. O. Williams, Trinidad.—Twelve Orchids from Trinidad, 17 packets of Palm seeds.

Mr. W. R. Dykes, Godalming.—Collection of Irises.

Mr. G. B. Michell, Perak.—Plants and seeds of 6 species of *Passiflora*.

Colonel S. R. Clarke, Cuckfield.—Seeds, *Juniperus procera*.

Mr. F. Fyles, Ottawa.—Seeds, *Zizania aquatica*.

Professor J. H. Wilson, St. Andrews.—Hybrid Passifloras.

Mr. R. Farrer.—Seeds from Upper Burma, including *Meconopsis* and *Cremanthodium*.

Sir Herbert Maxwell, Bt., Monreith.—Seeds of Iris from Tibet, and of a white Martagon lily.

Mrs. E. C. Villiars, Bexhill.—*Anaectochilus regalis* from Ceylon.

Sir Norman Lamont, Bt., Toward.—*Rosa saturata*.

Sir Edmund Loder, Bt., Leonardslee.—Various trees, including *Platanus hispanica*.

Sir John Ross of Bladensburg, Rostrevor.—Various shrubs.

Professor Gaudron, Ecuador.—*Salanum immita* and *S. Maglia*.

Major F. C. Stern, Goring-by-Sea.—*Lilium Farreri*, *Populus canescens* and *P. lasiocarpa*.

Donard Nursery Company, Newcastle, co. Down.—Various trees and shrubs.

Marquis of Headfort, Meath.—Various trees and shrubs.

Mr. A. Hislop, Rhodesia.—Various native plants.

Mr. R. H. Beamish, Ashbourne.—*Corylus tibetica*.

Messrs. Houghton and Co., Eastcheap.—Bulbs, *Urginea maritima*.

Corporal E. C. Phillips, Union Defence Forces.—Seeds of *Welwitschia mirabilis* and *Caralluma* sp.

Mr. J. S. Gamble, East Liss.—Seeds of *Dendrocalamus longispathus*.

Mr. M. T. Dawe, Bogotá, Colombia.—Seeds of numerous rare and interesting plants, including *Arecastrum* sp., *Quercus tolimensis*, *Arracacha esculenta* and Befarias.

Surplus plants were distributed as usual, either in exchange with botanic gardens or as gifts to various teaching institutions, and there was the usual distribution of seeds saved from the cultivated plants. The total number of packets distributed was 1833 of trees and shrubs, and 1151 of hardy herbaceous plants. The most important of the seeds obtained for special distribution were—Yebb (*Cordeauxia edulis*), *Ceratotheca sesamoides*, *Stevia Rebaudiana*, *Pouteria Frosiana*, *Rhopalostylis sapida*, *Bambusa arundinacea*, and *Pinus Armandii*.

Among the recipients of plants from Kew were the following:—

Weybridge Laboratory—489 trees and shrubs.

Mr. P. D. Williams, Lanarth—50 Eucalyptus Gunnii and other trees.

Mr. H. Clinton Baker, Oaklands.—Trees and shrubs.

Mr. A. Grove, Alder River Nursery.—Acers.

Lady Stair, Castle Kennedy.—Rhododendrons.

Mr. H. A. Moore, co. Down.—Chinese Rhododendrons.

Hon. Vicary Gibbs, Aldenham.—225 trees and shrubs.

Marquis of Headfort, Kells. Trees and shrubs.

Mr. F. R. S. Balfour, Dawyck.—Trees and shrubs.

Sir Hesketh Bell, Mauritius.—Wardian case of ornamental plants.

The flower beds and borders, which owing to the need created by the war had been devoted to the cultivation of vegetables, were restored to their former use. The parterre in front of the Palm House was sown with grass seeds in spring, and in the autumn the flower beds were cut out on a plan slightly different from the previous one. Potatoes were grown again on the lawn in front of the Palace, and vegetables in the nursery near the Palace.

Arboretum.—One of the most noticeable results produced in the Arboretum by the conditions of the last five years has been the overcrowding of shrubs in the botanical collections. The occupants of an ordinary shrubbery may be allowed to become fairly crowded without greatly reducing its use and effectiveness, especially where the system of grouping together plants of each species or variety is adopted, but in the botanical arrangements it is very desirable that each plant should have room for its full individual development, so that its character and value are shown. A thorough and systematic overhauling of many of the collections has, therefore, become necessary and a beginning was made last autumn with the barberries and magnolias. The central mound in the Berberis Dell is occupied almost wholly by barberries. These have been thinned out, duplicates removed and a grass path made over the mound so that plants in the centre can now be easily examined by visitors. Owing to the numerous new species introduced from China the collection is now a very extensive and interesting one, and of great horticultural value.

The plants in the fine collection of magnolias adjoining, which give one of the most popular displays at Kew every spring, were also suffering from want of room to develop. By the removal of a few common trees close by space has been obtained to enable us to spread out the magnolias. This genus has had some very interesting additions made to it through Mr. Wilson's work in China. Of these *M. officinalis*, *M. Wilsonii* and *M. Sargentiana* have for some time been established at Kew, and *M. Dawsoniana* and *M. Nicholsoniana* have recently been obtained. Another interesting specimen is a healthy plant of the Himalayan *M. Campbellii*, 18 ft. high, raised from seed sent from Calcutta in 1904. This species is usually considered to be not very hardy, but this tree has not suffered from cold up to the present. The

elegant *M. salicifolia* from Japan now flowers very freely every spring. *M. Wilsonii* flowered for the first time at Kew last summer; it is allied to, and seems to be as beautiful as, *M. parviflora*, and like that species flowers on the leafy shoots of the current year.

In the Berberis Dell is also situated the collection of *Helianthemum* and *Cistus*, which grow on a slope on the northern side. This slope has been transformed into small terraces by the use of some yellow limestone originally obtained from Gloucestershire for the Rock Garden.

The erection of the new flagstaff (see *K.B.*, 1919, p. 393), involved a certain amount of alteration and renovation in the immediate neighbourhood, but thanks to the care exercised by the contractors not so much as might have been anticipated.

The Water-lily pond in the Arboretum (J 5 on the Key Plan), formed originally in 1896, had become overshadowed and its area contracted by the vegetation overhanging its banks, much of which was composed of common laurel and other uninteresting material. Last spring much of this was removed and replaced by more ornamental and interesting plants. The occasion was also taken to provide swampy recesses on the banks for such water-loving plants as Siberian iris and *Primula japonica*.

Most of the lawns that during the war had been left to grow for hay have been got back to their original condition. This and the drought during the early summer reduced the hay crop much below that of previous years. The $2\frac{1}{4}$ acres of lawn in front of Kew Palace, ploughed up in 1918, were again planted with potatoes, the varieties used being "Majestic," "Ally," and "Kerr's Pink," all of which are immune from the dreaded wart disease. Good crops were obtained, and the potatoes of eating size were readily disposed of in the neighbourhood, whilst the "seed" was purchased by the Government of Luxemburg.

Valuable contributions either in the shape of seeds or of small plants of trees and shrubs were received during 1919 from the Botanic Gardens of Edinburgh and Calcutta, the Arnold Arboretum, Messrs. Eley, Elwes, G. W. E. Loder, Lionel de Rothschild, and J. C. Williams, the Marquis of Headfort, Sir Edmund G. Loder, and the Hon. Vicary Gibbs, the most important being seeds collected in China by Forrest and by Wilson in Japan and Korea. To the trade firms of Messrs. Hillier of Winchester, Chenault of Orleans, and White of Sunningdale, Kew has also to express its obligations for valued contributions.

Museums.—It is satisfactory to record that during the past year the work of the department has progressed more on normal lines as the Temporary Preparer and remaining Museum Porter returned from war service and much-needed work on the collections could therefore be accelerated. After a long period of service Mr. G. Badderly retired from the position of Preparer (*K.B.*, 1919, p. 315), and has been succeeded by Mr. L. J. Harding, who has acted for several years past as Temporary Preparer.

The donations to the Museums have not been numerous, but some interesting and valuable additions have been made to the collections. The work of checking and relabelling the specimens in Museum No. I is nearing completion, and it is much to be desired that at no distant date the interior of the building may be redecorated.

The Museum Staff has been busily engaged in naming and reporting upon a large number of varied economic products and in furnishing general information to correspondents, casual callers, and to the many individuals who have systematically studied the collections.

The Guide which has been prepared for Museum No. IV. has just been published.

Museum No. IV. is at the northern end of a walled garden to the left of, and three minutes' walk from the Main Gate, and two minutes' walk from the northern end of the Rock Garden. It occupies Cambridge Cottage, formerly the residence of H.R.H. the Duke of Cambridge and was opened to the public in 1910 (*K.B.* 1911, p. 69).

The object of the Museum is to direct attention to British Forestry, and in most instances the specimens on view have been grown, manufactured or collected in the British Isles. Where, however, a comparison between articles produced in Britain and other articles of a similar character produced elsewhere has been thought desirable, they have been included. A great deal still remains to be done to make the collections complete, but as numerous inquiries have been made regarding a guide, a provisional one has been prepared which will be added to as the collections increase.

Many of the objects connected with forestry operations are difficult to reproduce on a small scale in a museum, and at present the scope of this museum has been limited to collections of timber, fruits and seeds of trees, dried specimens of a few types of hardy trees and shrubs, photographs of isolated trees, plantations and natural regeneration of trees, the fungus and insect diseases of trees, articles manufactured from British-grown timber, and tools and machinery used in sylvicultural and arboricultural operations.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the *Bulletin*:—

Director, Botanic Gardens, Singapore.—Woods of *Araucaria Bidwillii*, *Eugenia simulans*, *Pithecolobium lobatum*, *Ardisia quinquegona*, etc.

Secretary, Royal Horticultural Society.—Dried specimens of Caa-ehé (*Stevia Rebaudiana*), Paraguay.

Miss Little, Colville Terrace, London, W.—Two straw hats, two bamboo baskets, and some miscellaneous fruits and seeds from Szechuan, China.

Mr. F. G. Clark, Manchuria Road, London, S.W.—Woods of Cedar (*Juniperus procera*), Ironwood (*Olea Hochstetteri*), and Red Stinkwood (*Pygeum africanum*) from British East Africa.

Mr. F. O. Creed, East Croydon.—Sample of wax from stem of *Ceroxylon andicola* from Tolima, Colombia.

Miss Yeo, East Dean, near Eastbourne.—Cones of *Cedrus Libani* from Mount Lebanon.

Mr. J. S. Gamble, C.I.E., F.R.S., East Liss, Hants.—Sections of Beech and Hazel injured by Honeysuckle.

Director of Agriculture, Southern Provinces, Nigeria.—Fibre, yarn and "Ufa" cloth prepared from the bark of *Conopharyngia pachysiphon*, also samples of twine prepared at Old Calabar from the fibres of *Agave americana*, *Agave rigida*, var. *sisalana* and *Hibiscus vitifolius*.

Mrs. Trelawney Adams, Beaconsfield, Kew Green.—Native dress of Hibiscus fibre, ornamented with ferns, from the Tonga Islands.

Messrs. Humphreys, Percival Ellis and Co., London, S.E.—Samples of Tanning bark and Tanning Extracts.

The Right Hon. Sir H. E. Maxwell, Bart., Monreith, Wigtownshire.—Wood of *Cotoneaster frigida*, grown at Monreith. Age of tree about 40 years.

Mr. M. T. Dawe, Bogotá.—Sample of "Bogotá Tea" (*Symplocos alstonia*), wood of *Haematoxylon Brasiletto*, specimens of Cinchona barks, etc.

Conservator of Forests, Bangkok, Siam.—Thirty-two specimens of Siamese woods. J. M. H.

Research in Jodrell Laboratory in 1919.—Mr. L. A. Boodle experimented in methods of examination of plant-fibres, and made some observations on anatomical structure in *Cyclamen* and other plants.

Mr. J. C. T. Uphof studied the anatomy of some xerophytic species of *Selaginella*, and also the structure and morphology of the rhizophore in this genus.

Mr. W. C. Worsdell carried out some further work on the vascular anatomy of the Dicotyledons, especially in connection with the occurrence of medullary bundles.

Presentations to the Library during 1919.—The continuation of the several periodicals and serials received in exchange for *Hooker's Icones Plantarum*, excepting those published in Germany and Austria, have been presented as in former years by the Bentham Trustees. It is hoped that the exchanges which have been interrupted by the war will soon be resumed, and that the sets at present imperfect will be completed.

Though the additions by presentation have been very numerous and are of great value in augmenting the efficiency of the library department at Kew, there are few publications among those received in 1919 which are more than ordinarily interesting, and therefore claim especial notice.

From many agricultural, botanical or other scientific establishments in Europe, the British Colonies, India, Netherlands India, and America liberal contributions of literature of

considerable usefulness have been sent. These include the publications of the Wellcome Chemical Research Laboratories, London, from the Director; twenty-five papers on Plant Pathology, from the Director, Station of Vegetable Pathology, Paris; *Mededeelingen van de Landbouwhoogeschool*, Wageningen, from Professor J. Ritzema Bos; *The Verbenaceae of the Malayan Archipelago*, etc., by H. J. Lam, and *Bijdrage tot de Kennis der Combretaceeën en Flacourtiaceeën van Nederlandsch-Indië*, by D. F. van Slooten, and other papers, from the Director, Botanic Garden, University of Utrecht; *Prinzipienfragen der Vegetationsforschung*, by H. Gams, from Professor Hans Schinz, Director, Botanic Garden, Zurich; *Anuari* and *Musei Barcinonensis Scientiarum Naturalium Opera*, from the Junta de Ciencies Naturals de Barcelona; numerous Memoirs and Bulletins of the Agricultural Research Institute, Pusa; the Indian Forest Records and other Government publications; *A Forest Flora for the Punjab with Hazara and Delhi*, by R. N. Parker, from the Conservator of Forests, Eastern Circle, Punjab; *The preparation and vulcanisation of plantation Para Rubber*, by B. J. Eaton and others, from the Director, Department of Agriculture, Federated Malay States; a considerable number of publications issued by the Department of Agriculture, Industry and Commerce, Netherlands India, including *De Nuttige Planten van Nederlandsch-Indië*, Dl. ii-iv., by K. Heyne, *Malayan Ferns and Fern Allies*, by Capt. C. R. W. K. van Alderwerelt van Rosenburgh, supplement 1, and *Mikrographie der Holzes*, by H. H. Janssonius, 5th part, from the Director; *Mededeelingen van het Algemeen Proefstation Avros*, Medan, Sumatra, from the Director; Bulletins and other publications of the Union of South Africa Department of Agriculture, from the Director of the Department and from Dr. Pole Evans, Chief of the Division of Botany; *Waipoua Kauri Forest: its demarcation and management*, by D. E. Hutchins, from the Commissioner of State Forests, New Zealand; selected publications of the United States Department of Agriculture, from the Secretary; *Journal of the Arnold Arboretum*, 2 numbers, and the continuation of the *Bulletin of Popular Information*, issued by the same establishment, from the Director, Prof. C. S. Sargent; the continuation of *Rhodora* and further *Contributions from the Gray Herbarium of Harvard University*, including a bound copy of vol. ii., from Prof. B. L. Robinson; the 3 parts published during the year of the *North American Flora*, from the Director of the New York Botanical Garden; numerous papers and bulletins on Plant Diseases from the Departments of Plant Pathology of Cornell and Purdue Universities' Agricultural Experiment Stations; Report for 1917–18 of the Agricultural Experiment Station, Santiago de las Vegas, Cuba, from the Director; and *Fibras texteis e cellulose*, by M. Pio Corrêa, from the Ministry of Agriculture, Rio de Janeiro.

The Secretary of State for India has presented a copy of *Indian Medicinal Plants*, by Lieut.-Col. K. R. Kirtikar and Major B. D. Basu. This work, which was published by the Panini Office,

Allahabad, comprises 2 quarto volumes of text and 1033 uncoloured plates. The latter are mostly copied from the well-known but often rare and not easily accessible works of Roxburgh, Wallich, Wight, Griffith, Brandis and others. From the same source has been received a *Report on an inquiry into the Silk Industry in India, 1916*, by H. Maxwell-Lefroy and E. C. Ansorge, in 3 thin folio volumes, and the third part of the *Flora of the Presidency of Madras* by J. S. Gamble, a copy of which has also been presented by the author.

Prof. F. O. Bower has sent a complete set in 7 parts of his *Studies in the Phylogeny of the Filicales*, which appeared in the *Annals of Botany*, 1910–18. Two copies of Prof. Bower's excellent little work on Sir J. D. Hooker, published by the S.P.C.K., have been received from the publishers.

The Trustees of the Bernice Pauahi Bishop Museum, Honolulu, have published a handsome volume on the Lobelioideae of the Hawaiian Islands, by J. F. C. Rock, and have kindly presented a copy to the library.

Mr. J. H. Maiden has issued during the year parts 36 to 38 of his *Critical Revision of the Genus Eucalyptus*, and Kew is indebted to him for these as well as for the parts received in previous years.

In 1889 Dr. L. H. Bailey commenced a series of volumes entitled *Annals of Horticulture in North America*, of which five volumes have been published, covering the years 1889 to 1893. Only one—that for 1890—was at Kew till a few weeks ago, when Dr. Bailey sent the volumes for 1889, 1892 and 1893. The 1891 volume, still wanting, has been out of print for a long time. A copy of *Bush Fruits*, by F. W. Card, has also been presented by Dr. Bailey.

Among the larger works received as presentations from their authors should be mentioned the following:—*Les Astérinées*, by G. Arnaud; *Etude anatomique de la famille des Ternstroemiacées*, by L. Beauvisage; *Science and Fruit Growing*, by the Duke of Bedford and S. Pickering; *El Jardin Botanico del Instituto de Segunda Enseñanza de la Habana*, by F. G. Cañizares; *The Marine Biological Station at Port Erin*, by W. A. Herdman; *Etude . . . des Chlaenacées*, by F. Gérard; *A Monograph of the Norwegian Physciaceae*, by B. Lynge; *Nature and uses of Madras Timbers*, by A. W. Lushington; *The Origin and Development of the Compositae*, a reprint of a series of articles in the *New Phytologist*, by J. Small.

The following have also been received:—*Flora y Fauna* and *Climatologia de la Provincia de Santiago del Estero* [Argentine Republic], by A. Alvarez, from Sir Reginald Tower; *Upper Cretaceous Floras of the Eastern Gulf Region in Tennessee, Mississippi, Alabama and Georgia*, by E. W. Berry, from the Secretary, Ministry of Agriculture and Fisheries; *Details of specimens of Rhododendrons found by Mr. G. Forrest in 1917* and *1918*, from Mr. J. C. Williams; *Antonio Jatta, 1853–1912*, from Mr. Mauro Jatta; *The Essentials of American Timber Law*, by J. P. Kinney, and *Indentification of the Economic Woods of the United States*, by S. T. Record, from Messrs. Chapman and

Hall; *Studien über Konstruktions-typen und Entwicklungswege des Embryosackes der Angiospermen*, by B. Palm, from Prof. G. Lagerheim, who has also sent several papers by himself and others; *Hortus Bengalensis*, by W. Roxburgh, from Mr. W. Small. The last named once belonged to Dr. W. Ainslie, the author of a *Materia Medica of Hindoostan*, and bears his autograph on the title-page.

The three Botanical Memoirs published by the Oxford University Press (1, *The Building of an autotrophic Flagellate*, by A. H. Church; 2, *Gossypium in pre-Linnaean Literature, by* H. J. Denham; and 3, *Thalassiophyta and the subaerial Transmigration*, by A. H. Church) have been presented by their authors.

Other contributions to the library have been received from Dr. J. C. Arthur, who has sent his recent papers on the Uredinales, Mr. B. C. Aston, Mr. R. T. Baker, Dr. P. A. A van der Bijl, Dr. J. Briquet, Prof. G. Bitter of Bremen, Dr. F. Börgesen, Dr. Brotherus, Dr. E. J. Butler, Prof. D. H. Campbell, Miss A. Camus, Dr. A. Chevalier, Prof. T. D. A. Cockerell, Dr. E. De Wildeman, Mr. O. A. Farwell, Dr. E. Foex, Sir T. R. Fraser, Prof. P. F. Fyson, Mrs. Grieve, Dr. E. Hassler, Prof. L. Hauman, Dr. W. Kinzel of Munich, Mr. C. C. Lacaita, Mr. C. G. Lloyd, Dr. E. P. Phillips, Lieut.-Col. Sir David Prain, Prof. F. Ramaley, Mr. H. N. Ridley, Dr. J. N. Rose, Dr. C. L. Shear, Mr. W. T. Swingle, Dr. A. Wartenweiler, Mr. C. T. White, Mr. E. H. Wilson and Mr. W. F. Wilson. The titles of their contributions cannot be given in this note, but those that are not excerpts from publications at Kew will be incorporated in a forthcoming supplement to the catalogue. The excerpts are arranged according to authors' names, and are easily accessible, without the aid of the catalogue, in the large collection of tracts preserved in the library.

Presentations of periodicals include, besides the new *Journal of the Arnold Aboretum* to which reference has already been made, the first number of *The Journal of Indian Botany*, edited by Prof. Fyson and presented by him, *Bulletin of the Rubber Growers' Association*, from the Secretary, *Jahresbericht der Gesellschaft zur Förderung der naturhistorischen Erforschung des Orients in Wien*, 1896–1913 (except 1907 and 1911), from Dr. Otto Stapf, and the *Journal of Pomology*, just begun under the editorship of Mr. E. A. Bunyard, and presented by the publishers, Messrs. George Bunyard & Co., Ltd.

Manuscripts that should be mentioned here are:—A collection of original letters from various botanists to Mr. J. F. Duthie, presented by Mr. Duthie; Piperaceae of the Malayan Peninsula for King & Gamble's *Materials*, by C. de Candolle, from Mr. Gamble: *Catalogue of Succulents and other Plants, cultivated in Succulent House, Royal Botanic Gardens, Kew*, 1872, by R. I. Lynch, from the author; a volume of original letters from W. Roscoe, of Liverpool, to N. Wallich, dated 1818–1830, from Mr. Leopold Cust, through the kind offices of Mr. H. N. Ridley. Numerous letters and other manuscripts relating to the *Flora of British India*, Bentham & Hooker's

Genera Plantarum, etc., have been presented by Lady Hooker, who has also kindly sent to Kew, at present as a loan, Sir J. D. Hooker's considerable and valuable botanical correspondence.

Additions to the Herbarium during 1919.—During the year about 22,000 specimens were received as donations or exchanges and 3380 acquired by purchase, while about 8000 were received on loan in addition to those temporarily deposited for the preparation of the "Flora of Madras." The principal collections are enumerated below:—

Europe.—*Presented*: Britain: Cornwall, by Mr. Edgar Thurston; Oxfordshire, by Mr. W. B. Turrill; plants cultivated by Mr. Thos. Clark at Bridgwater, by Mr. H. Stuart Thompson.

Orient.—Presented: Syria, by Lord Lamington and Miss M. L. Yeo; Palestine, Ephraim Hills, west of the Jordan Valley, by Capt. G. H. Ogilvie; Palestine, chiefly at Wady-el-Jib, by Mr. G. C. Johnson; Mesopotamia, by Capt. G. A. Watson.

Purchased:—F. Vester and Co., Palestine.

North Africa.—*Presented*: Egypt (Dr. A. Keller), by Dr. Hans Schinz; Morocco, by Professor C. J. Pitard.

China.—*Presented*: Chili Province; Peitaiho, Peking and Wofussu, by Mr. N. H. Cowdry.

India.—*Presented:* various localities, by Mr. R. S. Hole.

Malay Peninsular.—*Presented*: Pahang, etc. (Mohamed Haniff and Mohamed Nur), by Mr. I. H. Burkill; North-western coast and islands (J. H. N. Evans and C. Boden Kloss), by Mr. H. C. Robinson; various localities (H. N. Ridley), by Mr. I. H. Burkill.

Malaya.—*Presented*: Siam (Mohamed Haniff and Mohamed Nur), by Mr. I. H. Burkill; Siam, Rajburi District (Khoon Winit Wanadorn), by Mr. W. F. Lloyd; Fungi Malayana, centudies 4 and 5, by Mr. C. F. Baker; Philippine Islands (E. D. Merrill's collectors), by Prof. C. S. Sargent.

Australia.—*Presented*: South Australia, by Mr. J. M. Black; various localities, by Mr. J. H. Maiden and Dr. R. S. Rogers; Tasmania, by Miss L. S. Gibbs.

Tropical Africa.—*Presented*: Nigeria, Northern Provinces (H. V. Lely), by Mr. E. W. Foster; Sudan, Lado District (T. Cartwright and F. S. Sillitoe), by the Director of Forests, Sudan; British East Africa, highlands, by Mr. J. D. Snowden; British East Africa (members of the Forestry Department and Miss Werner), by Mr. E. Battiscombe: Uganda, by Mr. R. A. Dummer, Mr. T. D. Maitland and Mr. R. Fyffe; German East Africa, by Mr. E. Battiscombe on behalf of the Political Officer, Morogoro; Central Africa (Archdeacon W. P. Johnson), by the Rev. H. J. Riddelsdell; Rhodesia, by Mr. F. Eyles.

South Africa.—*Presented*: South-west Africa (Rautenen and Schlechter), by Dr Hans Schinz; Transvaal, by Dr. I. B. Pole-Evans; various localities, by the Bolus Herbarium.

North America.—*Presented*: Yukon (Miss Alice Eastwood) and the south-western United States (E. J. Palmer and B. F. Bush), by Prof. C. S. Sargent; British Columbia, Kelowna, by Miss E. M. Warren; and the following by the Gray Herbarium:—Plantae Exsiccatae Grayanae, centuries 2 and 3; Newfoundland and Labrador (M. L. Fernald); Quebec, Gaspé County (J. F. Collins and M. L. Fernald); Bermuda (F. S. Collins); South California (Mrs. Spencer); Texas (B. H. A. Groth); Florida (A. Fredholm).

Purchased: S. M. Zeller, Washington State; S. F. Collins, Phycotheca Boreali-Americana, fascicle 46.

Central America.—*Presented*: Mexico (Dr. E. Palmer), by Mr. F. V. Coville; Mexico and Cuba (Frères Arsène, Nicolas and Léonj, by Prince Roland Bonaparte; Nicaragua (C. F. Baker), by the Gray Herbarium.

West Indies.—*Presented*: Jamaica, etc. (W. Harris, Dr. N. L. Britton and others), by the Director-in-Chief, New York Botanical Gardens; Porto Rico, by F. L. Stevens; Bahamas (A. E. Wright), by the Gray Herbarium.

South America.—*Presented*: Colombia; Ruiz, Caldas, Department del Valle and Darien Country, by Mr. M. T. Dawe; Colombia (Mr. F. W. Pennell and Dr. H. H. Rusby), by the Director-in-Chief, New York Botanical Gardens.

Purchased: Dr. E. Hassler, Paraguay; Dr. Otto Buchtien, Herbarium Bolivianum, century 5 and supplement 1.

Mr. Edgar Thurston, C.I.E., has presented the herbarium of Cornish plants collected chiefly by himself during several years residence in Cornwall. The specimens were mountel by him on sheets uniform in size with those in use at Kew and form a valuable addition to the British collections, which are not well represented by recent specimens. Seeds of British plants have been given by Mr. W. B. Turrill to supplement the seed collection now being formed in the Herbarium. From Mr. H. Stuart Thompson has been received a collection of dried specimens of plants cultivated in the early part of the last century at Bridgwater by Mr. Thomas Clark. Southern Palestine plants have been received from Capt. G. H. Ogilvie and Mr. G. C. Johnson. Lord Lamington, G.C.M.G., Commissioner to the British Relief Unit to Syria, has presented specimens collected by him and Miss M. L. Yeo in the Lebanon, Antilebanon and Beirut districts. Specimens collected in Mesopotamia by Capt. G. A. Watson have been presented through Mr. A. Sharples. Prof. C. J. Pitard, of Tours, has presented a large collection made by him chiefly in Morocco. Various critical species of Indian plants have been contributed by Mr. R. S. Hole. Malay Peninsula plants have been represented by collections made in the north-western part of the peninsula and lower Siam under the auspices of the Director of the Federated Malay States Museum, which are being worked out at Kew by Mr. H. N. Ridley, as well as those from Pahang and other localities at the instance of the Director of the Botanic Gardens, Singapore. A fine set of Philippine plants gathered by Mr. E. D. Merrill's collectors has been presented by Prof. C. S. Sargent. Khoon

Winit Wanadorn has collected in the Rajburi District of Siam, and his specimens have been received through Mr. W. F. Lloyd, Conservator of Forests. Mr. J. H. Maiden has sent various Australian plants, including new species described by him. Mr. J. M. Black has presented specimens of some of the new species published by him in the *Transactions of the Royal Society of South Australia*, and Dr. R. S. Rogers has given Australian Orchids. A continuation, comprising *Coniferae*, monocotyledons and cryptogams, of the collection made in Tasmania by Miss L. S. Gibbs, F.L.S., has been presented by her. Botanical collecting has again been active in Tropical Africa. Two collections from the Lado District (one along the Yei River) of the Sudan have been received from expeditions organised by the Director of Forests, Sudan. Mr. J. D. Snowden has explored the highlands of British East Africa and presented his collections to Kew, while other parts of that region have been visited by members of the Forestry Department. Uganda Fungi have been contributed by Mr. T. D. Maitland and Mr. R. A. Dummer. Dr. I. B. Pole-Evans, Chief, Division of Botany, Pretoria, has continued to contribute Transvaal plants, and valuable specimens have been received from the Bolus Herbarium.

The North American collections have been augmented, especially by the contributions, detailed above, from Dr. B. L. Robinson, Curator of the Gray Herbarium, Harvard University. Dr. N. L. Britton, Director-in-Chief, New York Botanical Garden, has continued to send valuable instalments of West Indian plants collected by him, Mr. W. Harris and others, as well as a collection made in the Republic of Colombia by Mr. F. W. Pennell and Dr. H. H. Rusby. Mr. M. T. Dawe has made several expeditions in the last named country and forwarded his specimens to Kew.

The collection of illustrations consists largely of representations of portions of plants and their details, but is deficient in pictures showing the habits of trees and shrubs: this has been partly remedied by a donation of photographs of West Indian and East African trees from Dr. Andrew Balfour, C.M.G., Director-in-Chief of the Wellcome Bureau of Scientific Research, and of similar photographs of trees from the Malay Peninsula and Ceylon by Mr. H. N. Ridley, C.M.G.

A collection of photographs showing the appearance of important plant diseases in the tropics is in course of formation, and contributions have been received from Mr. L. Lewton-Brain, Director of Agriculture, Federated Malay States; Dr. I. B. Pole-Evans, Pretoria; and Sir Francis Watts, K.C.M.G., Commissioner of Agriculture, Barbados, on behalf of Mr. W. Nowell.

Effect of removing the Pulp from Camphor Seed on Germination and the Subsequent Growth of the Seedlings.—A reprint of a paper by Mr. G. A. Russell, of great importance to those engaged in the camphor industry, which appeared in the United States Journal of Agricultural Research, Vol. xvii, No. 5, has been issued from the Government Printing Office, Washington.

In Florida and other countries the development of the camphor industry has been checked by the low percentage of seeds which produced transplantable seedlings, about 10 per cent. being the average, therefore during the winter of 1916–17, and again in 1917–18, experiments were undertaken by Mr. Russell to determine whether, by the adoption of any special method of seed preparation before sowing, better results could be obtained.

Previous experience indicated that the removal of the pulp from the seeds before sowing hastened, if it did not increase, germination, whilst there was a prevalent belief that the exposure of the fruits to frost whilst on the tree was detrimental to seed germination. Therefore, these were two of the chief factors borne in mind whilst conducting the experiments. In addition, the action of fermentation, dry and moist heat, and sulphuric acid on the vegetative properties of the seeds was studied. Attention was also paid to the difference in the germinating qualities of seeds picked up beneath the trees during the early ripening period and those that were hand-picked from the trees a little later.

The results of the 1916–17 experiments proved conclusively that seeds from which the pulp had been removed previous to sowing, not only germinated more quickly than unpulped seeds, but that the percentage of seedlings rose from 9·4 in the case of seeds sown as gathered from the tree to 60·1 in pulped seeds. Seeds that fell to the ground early were found to be less fertile than those that remained on the trees to a later date. Before the removal of the pulp 5·9 per cent. of such seeds germinated, 15·6 per cent. germiating after the removal of pulp.

Exposure to frost on three successive nights, the lowest temperature being 26° F., did not result in the total loss of the power of germination, although about 50 per cent, fewer seedlings appeared than from unfrozen seeds. From frozen seeds, as gathered from the tree, 4·5 per cent. germinated and, after the removal of the pulp, 32·6 per cent. A curious result was obtained by soaking frozen seeds in water at a temperature of approximately 25° C. for 18 hours, for the germinating percentage of unpulped seeds was reduced, whereas the germination of pulped seeds was increased by 23 per cent.

One thousand seeds enclosed in a jar and fermented for 35 days failed to produce a single plant, but seeds fermented for 8–10 days and then spread out to cool and dry produced the normal number of seedlings. Seeds artificially dried at a temperature of approximately 55° C. failed to germinate, and the same thing happened after seeds had been allowed to air dry in an attic for several weeks. Soaking in water at a temperature as high as 50° C. had no effect on germination, but pulped seeds treated with 5 per cent. sulphuric acid failed to germinate.

In addition to the experiments confirming the view that pulped seeds germinated more quickly than unpulped, they also indicated that the earlier germination enabled a greater percentage of seedlings to reach a transplantable size; the few weeks earlier growth enabling them to withstand the effects of hot sun during spring. Seeds sown early in winter took longer to germinate than those sown in spring, but generally they formed sturdier plants.

The 1917–18 experiments were commenced in November, 1917, and in order to ascertain whether seeds taken from different trees possessed the same germinating qualities, seeds were gathered separately from 10 trees on November 27, and they were taken from all parts of the trees, so that each sample was thoroughly representative of the yield. They were sown on November 28, part as gathered and part pulped. The percentage of germination differed in the seeds from the different trees, but in every case the pulped seeds both germinated quicker and better than the unpulped. From the 10 trees the percentage of seedlings from unpulped seeds varied from 3 to 23·4, whilst for pulped seeds the minimum was 65·2 and the maximum was 95·4. A diagram illustrating the percentage of seedlings from each kind of seed from the 10 trees is both interesting and instructive.

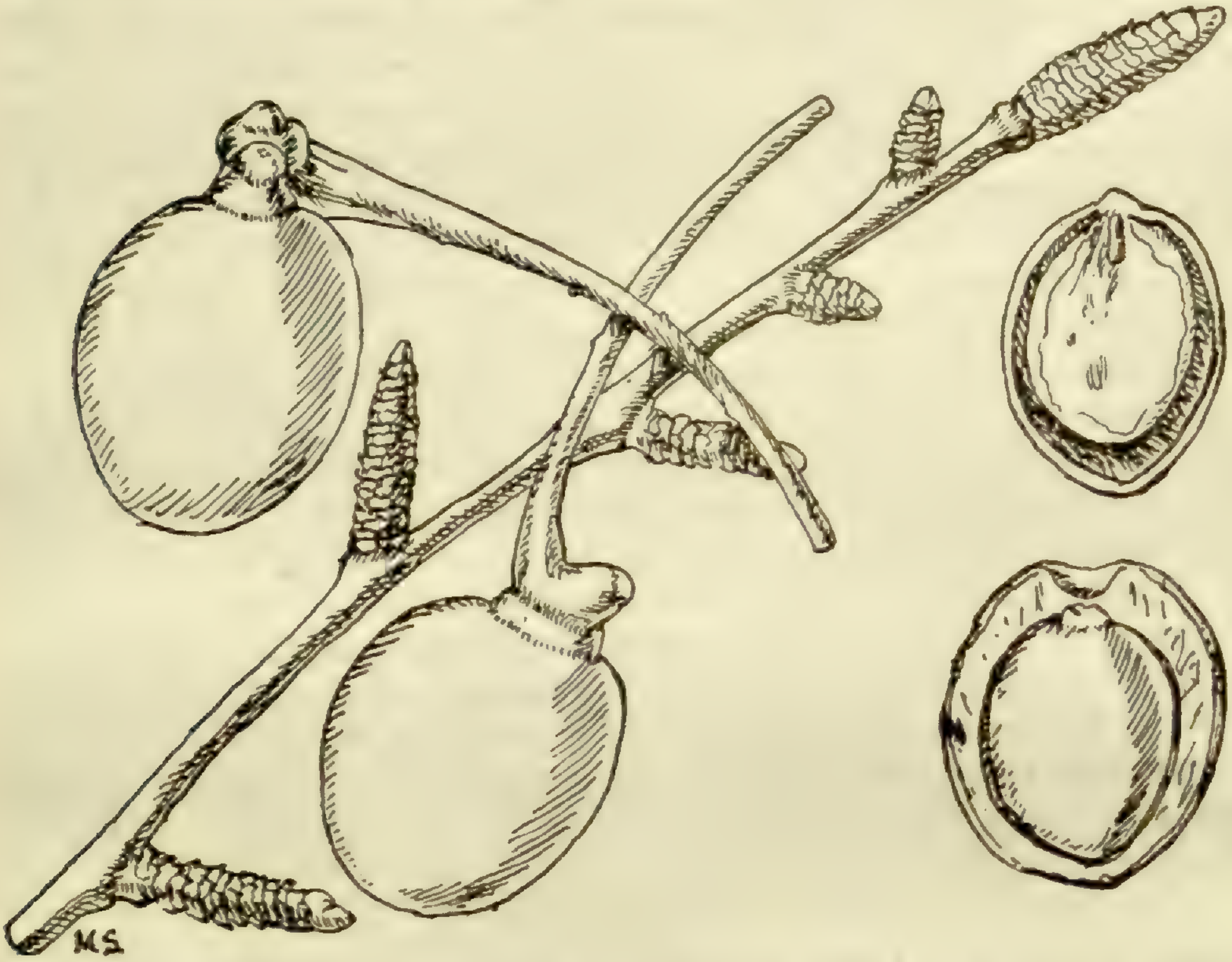
In this series of experiments the advantage of earlier germination was very pronounced. Seedlings from unpulped seeds gained on the average a fortnight's advantage, which enabled them to become well enough rooted to withstand the heat of the sun and the drying of the surface soil. At transplanting time, not only were the plants bigger, but they were better in every way. The increase in the number of seedlings of transplanting size secured by pulping the seed amounted approximately to 600 per cent.

In order to clean the seeds, it is recommended that the fruits should be rubbed through a wire screen and afterwards sun-dried for one or two days. W. D.

The Fruiting of the Ginkgo at Kew.—There does not appear to be any record of the Ginkgo having borne fruits in the British Isles. Kent, the author of Veitch's *Manual*, evidently had no knowledge of this having ever occurred, and observes merely that fruit is "rarely, if ever, seen in this country." Elwes and Henry, too, in *The Trees of Great Britain and Ireland*, p. 56, say that "no fruit so far as they know has ever been produced in England." It is worth while, therefore, to put on record the production of fruits at Kew.

Ginkgo biloba, as is well known, bears dioecious flowers; that is to say, the male and female flowers are borne on separate trees. The fine tree at Kew, the best known of all Ginkgos to the general public of this country, was planted where it now stands probably about 1760. Being then a very rare and precious plant whose hardiness had not been proved, it was planted against a wall and trained like a fruit tree. Ultimately the wall was taken down and the side branches of the Ginkgo were cut away, since when it has assumed its present fine shape and dimensions. It first bore flowers in 1795 which proved to be male. In recent years it has blossomed frequently; and sometimes so profusely as to litter the ground beneath it with its small, green, cylindrical inflorescences. It was this free production of staminate flowers which suggested that if female shoots were grafted on the tree, fruits might eventually be obtained. Accordingly application was made to Mr. Flauhault, Director of the Montpellier Botanic Garden, for grafts from the famous female tree that grows there

and each year bears fertile fruit. These he kindly sent in February, 1911, and they were duly "worked" on the tree at Kew. Some of them united satisfactorily, but nothing further was noticed until last November, when, on the leaves falling away from the branches, four fruits were seen to be hanging on one of the Montpellier grafts.



The "fruits"—bright yellow, a little over one inch long, like a small plum in shape and each borne on a stalk 1½ to 2 inches long—are not fruits in the strict botanical sense, but seeds with a thin fleshy covering. This outer layer has a most offensive odour resembling that of butyric acid, but the kernel of the seed is pure white when washed and edible. Mr. E. H. Wilson tells us that they are on sale in most of the market towns of China and Japan, also, but not so commonly, in those of Korea and Manchuria. Henry says that they are eaten roasted at feasts and weddings and are supposed "to promote digestion and diminish the effects of wine-drinking."

In regard to the sex of the Ginkgo there is a general impression that the female tree differs from the male in being less pyramidal, and in having spreading or even pendulous branches. Mr. E. H. Wilson, who has had a very large acquaintance with the Ginkgo, both in China and Japan, controverts this view in a recent number (November, 1919) of the *Garden Magazine*. He says there that he has never found it possible to determine the sex of a tree by its mode of growth and that both the Chinese and Japanese say it is impossible to do so.

A fine example of a female tree with spreading branches may be seen in the Botanic Garden, Padua (the ground below the tree was crowded with seedlings in 1918). Other fine female trees may be seen at Ouchy by the Lake of Geneva.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2] [1920

VII.—THE FLORA OF MADRAS: III.

The third part (pp. 391-577) *Leguminosae-Caesalpinioideae* to *Caprifoliaceae* of the Flora of Madras has now been published, and the following notes have been drafted by Mr. Gamble. We are indebted to him for the opportunity of placing these on record for the information of workers in herbaria, relative to conclusions with regard to particular species dealt with in the work that differ from those arrived at by earlier writers.

Notes on the Flora of Madras.*

J. S. Gamble.

Leguminosae–Papilionatae.—In the Key to the Genera at p. 276, line 2, after "1-seeded," should be inserted "(except nos. 24 and 25)." The omission was made inadvertently, and I am obliged to the Reviewer of Part ii in the "Journal of Botany," for July, 1918, p. 220, for drawing my attention to it. Both *Pycnospora* and *Pseudarthria* are clearly, as was pointed out in the "Genera Plantarum," nearly related to *Desmodium*, in which genus, indeed, one species, *D. gyrans*, has also the character of the joints of the pod not separating. *Arachis* also has the pod not jointed, while *Lespedeza* has only one joint, but both seem rightly to belong to *Hedysareae*.

Indigofera. I am still a little in doubt about the correct name for the well-known common shrub of the forest undergrowth described as *I. pulchella*, Roxb. In adopting this name I have only followed other works, but I am inclined to think that there are perhaps two species—the northern one, *I. elliptica*, Roxb., the southern one, *I. cassioides*, Rotte, though I found it impossible to give satisfactory distinguishing characters.

Tephrosia. I am much indebted to Mr. J. R. Drummond for his assistance in this genus which he has been studying for so long. I hope that his general paper on the genus will soon be published, with the descriptions of his new species. *T. wynaadensis* and *T. Barberi*.

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* Previous notes were published in the *Bulletin* for 1916, p. 57, and for 1918, p. 222.

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Sesbania. I have not followed Dr. Merrill in taking the Linnean specific name and changing *S. aegyptiaca*, Pers. into *S. Sesban*; see Philipp. Journ. Sc. vii. 235. In my opinion, *S. Sesban* practically is a "duplicate binomial," and so I think it best to adhere to the well-known name of *S. aegyptiaca*.

Smithia. An omission under *S. geminiflora*, Roth, requires correction. Before "W. & A. 220," should be inserted "*S. sensitiva*, Ait."

Desmodium. True *D. Cephalotes*, Wall., occurs in the hills of the Northern Circars, specimens of it, collected in the hills of Ganjam, having recently been received at Kew. When I prepared the account for the Flora, I possessed leaf specimens from the hills of Vizagapatam which I believed to belong to it. They were, however, unfortunately without fruit, so that I could not be sufficiently sure about it. It must now be added to the Flora.

Erythrina. I have described in *Kew Bulletin*, 1919, p. 222, as a new species, *E. mysorensis*, from a specimen collected by Mr. Meebold at Chickenhalli, in Mysore. There is, however, I think it right to explain as I did in the *Kew Bulletin* referred to, a possible doubt as to its being really an indigenous Indian plant. It may have been collected in a garden, but I have gone carefully over all the specimens preserved at Kew and have not found any that agree with it, so that I think it was best to describe it as if it were certainly indigenous.

Pongamia. I received Dr. Merrill's "Interpretation of Rumphius' Herbarium Amboinense" too late for considering the question of adopting the name *P. pinnata* instead of *P. glabra* for the well-known Indian tree. Dr. Merrill considers that it is the *Cytisus pinnatus*, Linn., and that consequently the specific name *pinnata* has priority.

Derris. *D. eualata* was described in Beddome's Icones t. 186, but in my opinion, the description in the "Flora of British India" does not fit it at all well, while that of *D. platyptera*, Baker, agrees much better. The specimens written up at Kew as *D. eualata* are really *D. brevipes*, and those named *D. platyptera* correspond to Beddome's figure and description of *D. eualata*. It is strange that the important character of the diadelphous stamens shown in Beddome's figure is not mentioned in the "Flora of British India."

Leguminosae–Caesalpinioideae.—*Caesalpinia.* The reasons for abandoning the specific names, *Bonducella* and *Bonduc*, are given by Dr. Merrill in Philipp. Journ. Sc. Botany, v. 53, and Interp. Rumphius' Herb. Amboinense, 260. It seems to me that his arguments are sound, and I have consequently described the first two species as *C. crista*, Linn., and *C. Jayabo*, Maza. I think it is an advantage to get rid of the confusing names *Bonducella* and *Bonduc*.

Delonix. As Dr. Merrill has pointed out, the generic name *Poinciana* was established by Linnaeus for the plant now known as *Caesalpinia pulcherrima*, consequently *Poinciana*, Linn., cannot be maintained for *P. regia* and *P. elata*. It is unfortu-

nate that such a well-known name has to go, but it cannot be helped.

Leguminosae Mimosoideae. –*Mimosa*. The discussion of the Indian species of *Mimosa*, and especially of those which have been considered to belong to *M. rubicaulis*, is the subject of a separate paper in the *Bulletin*. I am convinced that *M. rubicaulis*, Lamk., is a south Indian species only, and have described the Himalayan species as *Mimosa himalayana*. I have also described as a new species, *M. Barberi*, chiefly from Dr. Barber's specimens from Godavari. I first called it *M. angustisiliqua*, and as such it appears at p. 421 in two places. I then found that the name was inadmissible, so that it should be corrected to *M. Barberi*. The separate paper referred to contains the explanations regarding the species of *Mimosa* for the Western Peninsula of British India.

Rhizophoraceae.—The nomenclature in the Tribe of *Rhizophoreae* is rather confusing, and has been much discussed, most lately by Merrill in his Interpretation of Rumphius' Herbarium Amboinense, published in 1917. He follows Trimen (Journ. Linn. Soc. xxiv, 142), in establishing the fact that Linnaeus' *Rhizophora conjugata*, represented in Hermann's Herbarium by a figure only, is really *Bruguiera gymnorhiza*, Lamk. This necessitates altering the name *Rhizophora conjugata*, given by Henslow in the 'Flora of British India' to the second species of that genus, which now becomes *R. Candelaria*, DC.

It may be useful to record the identifications of the Mangroves figured in Rheede's 'Hortus Malabaricus,' figs. 31-37.

Fig. 31-32.	'Kandel' — *Bruguiera conjugata*, Merr.	*Rhizophoraceae.*
,, 33.	'Kari Kandel'—*Bruguiera cylindrica*, W. & A.	
,, 34.	'Pee Kandel'—*Rhizophora Candelaria*, DC	
,, 35.	'Tsjeru Kandel' — *Kandelia Rheedii*, W. & A.	
,, 36.	'Pou Kandel'—*AEgiceras majus*, *Gaertn.*	*Myrsinaceae.*
,, 37.	'Kada Kandel'—*Lumnitzera racemosa*, Willd.	*Combretaceae.*

Combretaceae.—While travelling on Forest duty in various parts of South India I could not help being struck by the inadequacy of the arguments by which the well-marked species of *Terminalia*, *T. crenulata*, *T. tomentosa*, and *T. coriacea*, admitted by Wight and Arnott, were joined together into one species, *T. tomentosa*, in the 'Flora of British India.' I have, therefore, gone back to the arrangement of Wight and Arnott. *T. glabra*, W. & A., is not, I think, the same as *T. Arjuna*, but a separate North Indian species. Also, among the specimens which I had available for study, I found some which had the velvety fruits of *T. Bellerica*, though usually larger, but were different in leaf and inflorescence. On carefully comparing the description in Hooker's Journal of Botany, iii. 27, I came to the conclusion that

in all probability these specimens belonged to *T. Gella*, Dalz., but unfortunately I have failed to find any authentic specimens of the plant, and Beddome, in his 'Flora Sylvatica,' p. ciii, says he had never met with it. The only point in which Dalzell's description does not agree with the specimens I had before me was that of the glands on the petiole, which most, though not all, of the specimens possess, while Dalzell says they are absent. I have thought it best to assume that the specimens belong to *T. Gella* until the discovery of Dalzell's original specimens settles the question finally. *T. Gella* is not accounted for in Cooke's 'Flora of the Bombay Presidency.'

Myrtaceae.—*Syzygium*. Since Part 3 was published, specimens from the collections of Colonel Beddome of the following two species of Ceylon plants gathered by him in the Anamalai Hills have been presented to Kew by the Madras Herbarium. The following are the necessary additions to the key and descriptions.

Flowers in short terminal cymes, the ultimate branchlets umbellate, 3-flowered; calyx-tube 0·75–1 in. long, glabrous, funnel-shaped, the mouth truncate with small rounded lobes; leaves oval-elliptic, obtuse at apex and base, 1·5–2 long, 1 in. broad, Crowded, the nerves at right angles to the mid-rib; petals pinkish ... ... 3.* *Fergusoni.*

3.* **Syzygium Fergusoni**, *Gamble*, n. comb. *Eugenia Fergusoni*, Trim. Fl. Ceyl. ii 172, t. 38.

W. Ghats, Anamalai Hills at 6000 ft. (*Beddome*).

A small or middle-sized tree with conspicuously long funnel-shaped calyx-tube.

Leaves chartaceous, oblanceolate-spathulate, obtuse or slightly acute at apex, much narrowed at base, up to 2 in. long, ·75 in. broad, nerves distant; inflorescence-branches slender, the flowers very small, pinkish-white ... ... 9.* *olivifolium.*

9.* **Syzygium olivifolium,** *Gamble*, n. comb. *Eugenia olivifolia*, Duthie in F.B.I. ii 495.

W. Ghats, Anamalai Hills at 7000 ft. (*Beddome*).

A small much-branched tree with inconspicuous flowers.

Melastomaceae.—*Osbeckia*. There is, and always has been, some difficulty about *O. aspera*, Blume, which is *Melastoma asperum* Linn. I have only found one Indian specimen at Kew, and that is in the Wallich Collection, no. 4073 A. Hb. Madr., collected at Courtallum by Mr. D. Mitchel, though there is also another small piece without name or locality, very likely another specimen of the same collecting. The rest of Wallich's no. 4073 is, in my opinion, A_2 and B *O. minor*, Triana, from Travancore, A_3 *O. glauca*, Benth., from Trincomali, Ceylon. I do not agree with C. B. Clarke in thinking that *O. minor*, *O. aspera*, *O. Kleinii* and

O. glauca can only differ by very minute characters, they seem to be quite easily distinguished from each other and from the three new species which I have thought it right to describe out of the rather heterogeneous sheets included in the Kew cover of *O. aspera*, viz.: *O. lineolata*, *O. courtallensis* and *O. Lawsoni*. They have been published in the *Kew Bulletin*.

I am not sure that *Osbeckia rostrata*, D. Don, var. *pulchella*, Triana, of which there is a specimen in the Kew Herbarium, should not be considered as a separate species. Beddome sent it to Kew with a description as *O. recalva*, but C. B. Clarke considered it to be the same as var. *pulchella*, though it seems to me different from the specimens of that variety from Bengal, Wall. Cat. 4059 and 4063, which do not quite answer to Clarke's description.

Osbeckia cupularis, Don, seems to be as often 5-merous as 4-merous, and this has to be remembered by field botanists who may be puzzled by the explanatory notes of Clarke's in the 'Flora of British India.'

Osbeckia sublaeris, Cogn. Of this species I have seen no authentic specimens, so that my identification of those which I have assumed to belong to it had to be done entirely by the description. I believe that my identification is correct. As I collected it myself on the rocks near the road leading to Sispara in the Nilgiris, I remember it as a small, almost fleshy, undershrub with very bright large flowers.

Since Part 3 was published, specimens of the following two Ceylon mountain species have been sent to Kew by the Madras Herbarium from the Travancore-Tinnevelly mountains. The following are the necessary additions to the key and descriptions:—

Tufts of bristles mostly stalked, some, on the lower part especially, sessile, appendages long-stalked, calyx-lobes triangular-lanceolate, pectinate on the margins.

Calyx-lobe with one large tuft of bristles at apex, simple bristles on the mid-rib at back, the bristles straight; leaves elliptic-oval, obtuse or obtusely acute at apex, subcordate at base, scabrous-hairy, up to 3 in. by 1·5 in., 5-ribbed. 7.* *rubicunda*.

Calyx-lobes with many bulbose bristles towards apex and on midrib at back, the bristles long and curved; leaves orbicular-ovate, cordate at base, ferruginous-villous, the margins recurved, ·5 in. in diameter, strongly 5-7-nerved, the nerves impressed ... ... 7.** *buxifolia*.

7.* **Osbeckia rubicunda,** *Arn.*; F.B.I. ii 520.

W. Ghats, on Agastiamalai peak, Travancore-Tinnevelly boundary, about 6000 ft. (*Barber*).

A shrub with large purple-red flowers in terminal clusters.

7.** **Osbeckia buxifolia,** *Arn.*; F.B.I. ii 518.

W. Ghats, on Agastiamalai peak, Travancore-Tinnevelly boundary, about 6000 ft. (*Barber*).

A much branched densely woolly shrub with large purple-red flowers among the upper leaves.

Memecylon. This very difficult genus has given trouble to most of those who have worked at it. This has been explained as regards the Ceylon species, in a note at the beginning of the genus in Trimen's 'Flora of Ceylon,' and, in the 'Flora of British India' Mr. C. B. Clarke found himself reduced to beginning with those species which seemed most distinct and grouping the "enormous mass of specimens that appear difficult to separate" under one, *M. edule*, Roxb. It is unfortunate that the "mass of specimens" available contains so many in a somewhat fragmentary condition, which makes it difficult to correlate flowering and fruiting ones, while the fact that in so many species the nervation of the leaves is difficult to distinguish increases the difficulty. In J. Burmann's 'Thesaurus' two species are figured, which were afterwards mentioned by his son, N. Burmann, in his 'Flora Indica,' as *M. capitellatum* and *M. umbellatum*. The former, the original type of the genus, described by Linnaeus in the 'Species Plantarum' in 1753, is, as stated by Trimen, "our best-marked species," and seems to be an endemic Ceylon plant. It is admirably figured in Trimen's Plate 41, and I have seen no Indian specimen that can be referred to it. The latter, also described from a Ceylon plant, according to Trimen from the figure given by Burmann, has been, I consider rightly, identified by Trimen with *M. ramiflorum*, Lamk., which occurs in the Southern District of Madras as frequently as it does in the low country of Ceylon. It is fortunate for me that during some eight years spent in the Madras Presidency, I was much attracted by these beautiful shrubs whose geographical distribution I think I understand fairly well, and I am convinced that this species is the one with small rather yellowish leaves and dry yellowish berries, so common in Carnatic districts from the Kistna river southwards to opposite Ceylon. In Wight's 'Illustrations' and in Wight & Arnott's 'Prodromus' it is clearly, in my opinion, meant by both their *ramiflorum*, Lamk., and *tinctorium*, Koen., and this seems to have been the view taken by Triana.

Now comes the question of Roxburgh's *M. edule*, Cor. Pl. t. 82. Roxburgh's own specimen is in the Wallich collection at Kew, No. 4107 A. and in his own descriptions in the 'Coromandel Plants' and 'Flora Indica,' he says it is "a very common small tree or large shrub to be found in every jungle all over the (Coromandel) coast." This is also mentioned in Rees' 'Cyclopædia.' He describes it as having smooth shining oval leaves and bluish-black pulpy edible berries. This agrees well with the plant which I know and have collected in Circar Districts from Orissa southwards to the Cuddapah and N. Arcot Ghát slopes, but not further south. Roxburgh's specimen has the leaves more acute at the base and more acuminate at the apex than his figure shows or as do my specimens, and he gives their size as '3–4 in. long by 2–3

in. broad,' which is larger than any specimen shows or than his figure depicts. I think that the measurements are, at any rate, extreme. In any case, I feel sure, for my own part, that Roxburgh's *M. edule* is the common species of the North Coromandel coast and adjacent hills, which undoubtedly has shining leaves and blue-black pulpy fruit. I cannot identity with it any other of the species described by other authors, unless perhaps it is the *M. ovatum*, Sm. in Rees Cyclop. in part, as recognised by Triana. Most of the specimens in the Kew Herbarium written up by C. B. Clarke as *M. edule* var. *ovata* seem to me to belong rightly to *M. grande*, Retz, as was recognised by Trimen. Of the Madras plants, therefore, placed by Clarke under *M. edule*, I propose to accept three species, *M. edule*, Roxb., *M. umbellatum*, Burm. f., and *M. grande*, Retz (*M. edule* var. *ovata*, Clarke) as well as *M. molestum*, a little known plant of the Anamalai hills with quadrangular branchlets. Clarke's var. *Rottleriana*, distinguished by larger flowers and longer peduncles, does not seem capable of separation as a species, or even as a variety, from *M. umbellatum*. It was collected by Heyne and seems to be the same as Wall. Cat. 4107 B.

The genus *Memecylon* is one which presents considerable difficulty, especially when one is dealing with dried specimens, many of those available being rather imperfect and "scrappy." It is a pity that I had not the Madras Herbarium specimens available, but when travelling about the Madras Presidency on Forest Department work in the years 1882–1890 the genus interested me and I collected many specimens myself. It may be not out of place here to put on record my idea of the geographical distribution of the chief species, because they seem to me to occupy fairly well defined regions. In the "dry evergreen" forests of the East Coast from Orissa down to the latitude of Madras the common and almost only species is *M. edule*, Roxb. In the more southern forests, overlapping *M. edule*, *M. umbellatum* is found from near the Kistna river southwards to Cape Comorin and westwards to the slopes of the Ghâts. It passes over into Ceylon which *M. edule* does not, and in Ceylon is found, apparently quite endemic, the pretty and well-marked *M. capitellatum*, so well figured by Burmann and in Trimen's Flora. On the West Coast the chief species is *M. grande*, not unlike, but distinct from *M. edule*, as well as other but less abundant species like *M. depressum*, *M. Talbotianum*, *M. deccanense*, *M. terminale*, *M. gracile*, and in the extreme south *M. angustifolium*. We now come to the hill species: the first to appear, in the Deccan hills of Cuddapah, extending to Coimbatore and the Nilgiris, is the slender *M. Lushingtonii*. In the Shola forests of the Nilgiris and Pulneys the most common species is *M. malabaricum*, very noticeable about Coonoor and other places for its bright flowers. We also get the yellow-leaved *M. flavescens* on the east and *M. molestum* on the west, while towards Sispara and Naduvatam the handsome *M. sisparense* is conspicuous. Away to the north, on the Bengal-Central Provinces border, a little known species occurs at high levels which I have called *M. madgolense*. It is to be hoped that Madras botanists and forest officers will continue to pay attention to the genus and collect specimens both in flower and fruit, and obtain further

information about the distribution of the species. I am fully conscious of the imperfection of my account in the 'Madras Flora,' and I may very likely have made too many species, but I have tried to study and do my best with the material available.

Lythraceae.—In this family I have adhered as nearly as possible to the arrangement adopted in Koehne's Monograph (Engler's Pflanzenreich), more especially as regards the subdivision of Ammannia (Genera Plantarum), into the three genera —*Rotala, Ammannia and Nesaea*. The only difficulty I have found is in Rotala, in which genus it is not at all easy to separate the species *R. leptopetala*, Koehne, and *R. densiflora*, Koehne. This has been fully pointed out by Blatter and Hallberg in a paper in the 'Journal of the Bombay Natural History Society, xxv 701.' in which they finally settle to combine the two species in one, *R. pentandra*, Blatt. and Hallb. I should, however, think that if their view is adopted, the oldest name would be *R. densiflora*. So far as the Madras material is concerned, I have succeeded, with the help of the lists of numbers given by Koehne, in separating the species fairly clearly, and I propose to adhere to the separation. The same authors also propose to put *R. macrandra*, Koehne, under *R. rotundifolia*, as in genera of *Lythraceae* the length of the stamens cannot be considered a safe character of division. There is much to be said for their point of view; all the same I prefer to leave the species as arranged by Koehne. The *macranda* specimens are quite easy to recognize.

Lagerstroemia. For the reasons given by Sir G. King in his 'Malay Materials' and Dr. T. Cooke in his 'Flora of Bombay,' I have adhered to the well-known name *L. Flos-Reginae* for the splendid flowering tree so much grown in India, instead of *L. speciosa*, Pers. The two species, *L. Thomsonii*, Koehne, and *L. Rottleri*, C. B. Clarke, are apparently very little known and deserve to be carefully looked for by local botanists and forest officers in Madras.

Samydaceae.—I regret that, by an oversight, the genera *Casearia* and *Homalium* were not described, as I think they should have been, under *Flacourtiaceae* in Part I. In that Part, the 'Flora of British India' was followed and the *Flacourtiaceae* joined to *Bixaceae* in which only Bixa should have been described, *Cochlospermum* being quite distinct, in a family of its own, *Cochlospermaceae*.

Casearia. I cannot agree with Sir D. Brandis ('Indian Trees,' p. 343) in combining *C. glomerata*, Roxb., and *C. graveolens*, Dalz. The latter is a very widespread small tree of low levels in Northern India, deciduous and with its leaves turning red before they fall, and is, I think, very distinct from the tall, apparently evergreen, *C. glomerata* of the Sikkim forests, about 7000 ft. I have been much puzzled to identify the species figured by Beddome (Flora Sylvatica, t. 208) as *C. varians*, Thw., and coming from the "dense moist forests of the W. Ghats at 2000 3000 ft. elevation." The figure does not agree with *C. esculenta*, Roxb., as Clarke and Bourdillon have identified it, nor entirely, though nearer, with *C. rubescens*, Dalz. There are two specimens in the Kew Herbarium, collected by Bourdillon—(1) No. 181 from ever-

green forests at Peermerd, 3500 ft., which, I think, is a form of *C. rubescens* with more lanceolate leaves than the Bombay plant; and (2) No. 104 from evergreen forests near Colatoorpolay, which is, I believe, the plant of Beddome's figure. I have, therefore, assumed it to be so, and, pending the possibility of examining more and better specimens, I am calling it *C. varians*, bedd. *not of* Thw.

In his account of *C. varians*, Beddome also mentions as very common on the higher ranges of the Anamalais at 6000-7000 ft. and in Ceylon a tree with coriaceous leaves drying black. He identifies it with *C. coriacea*, Thw., which Trimen says is only a Ceylon species. I have seen no specimens from the Anamalais, but I believe it to be the tree of which I myself collected specimens at 7000 ft. on the Nilgiris, and which Sir A. and Lady Bourne collected at Gundattu Shola on the Pulneys. Fyson mentions this (Bourne 937), but says it was probably planted. Except that the leaves are rather larger, the specimens agree with Thwaites's from Ceylon.

VIII.—BOTANICAL EXPLORATION IN CHILE AND ARGENTINA.*

W. B. Turrill.

Argentina was first visited by Europeans in the year 1516, when a company of Spanish adventurers under the leadership of Juan Diaz de Solis landed near the Rio de la Plata in search of a passage to the East Indies. In 1520 the Spanish King, Charles I. (better known as the Emperor Charles V.), sent Ferdinand Magellan (Fernando de Magellanes), a Portuguese, on an expedition round the world and in October, 1520, he discovered the straits now named after him. Chile was added to the Spanish dominions, by conquest and exploration from Peru as a centre, in 1540. Among the first explorers of these regions are included J. le Maire, W. C. Schouten, J. Hermite, Diego de Almagro and Pedro de Valdivia.

Some of the early authors refer more or less casually to plants and vegetable products, e.g., Azara, Najera, Orvalle and Rosales. **Louis Feuillée** (1660–1732), undertook a journey in South America between the years 1709 and 1711, and with him the botanical exploration of our area may be said to have commenced. He made observations and conducted researches at Buenos Aires, Montevideo, Concepcion and Valparaiso, and his results were published in three volumes with 50 plates (Journ. des observ. phys. math. et bot. Paris 1714). The work is largely a herbal and the nomenclature pre-Linnean. **Frezier** in 1712 to 1714 visited Valparaiso (where he lived 8 months), Santiago and Coquimbo. He is perhaps best known as the author who was indirectly responsible for the transfer of the name Pomme de Terre from *Helianthus tuberosus* to *Solanum*

* This essay was written privately for Mr. G. W. E. Loder, and it is published here with his kind permission.

tuberosus. He explored the central provinces and was the first to introduce *Fragaria chiloensis* to Europe. His work, "Relation du Voyage de la Mer du Sud aux côtes du Chily et du Perou," was published in 1716-1717, and an English translation appeared in 1717. **Jorje Juan** and **Antonio de Ulloa** (1744) during their travels investigated certain indigenous and economic plants of Chile, and facts of botanical interest will be found in their works, of which the "Relacion historica del viage à la America meridional" (Madrid, 1748) has been translated into English under the title "A Voyage to South America," and has been passed through four editions in this language. **Olivares** also noted many of the natural products of the country. The French botanist **Philibert Commerson,** who accompanied Bougainville's Expedition (1767–1768) as surgeon and naturalist, brought back from the areas around the Magellan Straits an important collection of plants which became the basis of our knowledge of the Magellanic flora. His collection is in the Herbarium of the Muséum d'Histoire Naturelle, Paris. *See* Life of Philibert Commerson by Pasfield Oliver, pp. 93 seq., 226. The collections of **Banks** and **Solander** (Cook's First Voyage, Everyman ed., p. 14 seq.) added largely to the number of plants known from these regions and are chiefly at the British Museum. **Forster** and **Sparrman** (Cook's Second Voyage, l.c., p. 203), 1772-1775, investigated especially the forest vegetation on the south-west of the Fuegian Archipelago.

In 1777 **H. Ruiz** and **J. Pavon** were authorised by the Spanish Government and King (Charles III.) to conduct natural history research in Peru and Chile in connection with **J. Dombey** a French doctor and botanist. After collecting in Peru they extended their researches to Chile traversing the territories of Concepcion, Itata, Rere, and Arauco, the provinces of Puchacay, Maule, San Fernando, Rancagua, Santiago and Quillota and part of the Andes. They returned to Lima with numerous specimens, notes and drawings. **Many of these were** lost through the wreck of the ship "le San-Pedro d'Alcantara" off Portugal in February, 1786, except Dombey's collections (including many duplicates of Ruiz and Pavon), which reached Europe safely and are at Paris (Herb. Mus d'Hist. Nat.) etc. *See* Ruiz & Pavon, Prod. de la fl. Per. et Chil. (1794), and Flora Per. Chil. (1798-1802). Their later explorations relate to Peru only.

A. Menzies was surgeon and naturalist to Vancouver, 1790-1795, and observed the flora and collected plants in Chile etc. His collections are at the British Museum and Kew. He introduced *Araucaria imbricata* into cultivation in Europe in 1796. **T. Haenke** also explored parts of Chile, but his work is of secondary importance. *See* Presl, Reliquiae Haenkeanae, Prague, 1830. Several Chilean Jesuits (**Molina, Gomez de Vidaurre,** etc.) wrote accounts of Chile containing information concerning the vegetation. The **Abbe Don J. Ignatius Molina** (1740-1829) was a native of Chile. His original work on this country was written in Italian, the author having fled to Bologna when the order of the Jesuits was suppressed in the Spanish possessions. The first part containing the natural history was published in

1787, the second part containing the civil history not till some years after. An English edition, entitled "The Geographical, Natural and Civil History of Chile" was published in 1809. An entire chapter of 36 pages is devoted to "Herbs, shrubs and trees," chiefly plants of economic value being described and named. There is also a systematic list "of the various species of natural productions" which includes the plants described in the body of the work. The German **Adalbert von Chamisso** collected (1816) around Concepcion.

J. Miers resided several years in La Plata and Chile. He landed at Buenos Aires in March, 1819, and traversed the country to Mendoza through Luxan, Salto and the provinces of Santa Fé, Cordoba (Cordova), and San Luis. From Mendoza he crossed the Paramillo range and the Uspallata desert and arrived at the valley of Tupungato. He then journeyed to Santiago and on to Valparaiso. Most of his numerous drawings, descriptions and notes have never been published. His herbarium of 20,000 sheets and MSS. are mostly at the British Museum. He published his "Travels in South America" in 1825, and monographs of various orders largely dealing with South American plants.

H. Cuming in 1819 made a voyage to South America and settled at Valparaiso. His most important work was connected with conchology, but he collected many botanical specimens, especially in Chiloe, the province of Maule, and in the neighbourhood of Concepcion, of Valparaiso and of Coquimbo. **Alexander Caldcleugh** aided Cuming, and his collections included plants from Santiago and Coquimbo. He also crossed the Pampas from Buenos Aires to Mendoza. **Capt. Beechy** visited Concepcion in 1825 and Valparaiso in 1825 and 1828, and also Coquimbo. His plants were described by W. J. Hooker and G. A. W. Arnott, "Botany of Capt. Beechy's Voyage," 1841. Hooker and Arnott had previously published in Botanical Miscellany, vol. iii., 1833, p. 129, under the title "Contributions towards a flora of South America and the Islands of the Pacific," an account of plants collected by numerous workers: Bertero, Bridges, Cruckshanks, Cuming, Miers, Gillies, Macrae, Darwin, etc.

T. Bridges was a Kew Collector in Chile, Peru, Bolivia, and California, 1827–1865. He collected plants in the neighbourhood of Valparaiso and Valdivia and up to Lake Runco in the Andes during an expedition against Indians. Another journey took him up into the Andes via the Plainchon Pass, while other plants received from him came from the province of Colchagua. He left Valparaiso for the north of Chile and explored the districts of Copiapo, Balenar and Trierina and crossed on foot the deserts between Copiapo and Huasco. He then returned along the coast to Coquimbo, some days afterwards taking the route to Valparaiso, passing by Andacolla and Petorca and descending the valley of Aconcagua he went by Quillota (Quittota).

Officers of **Capt. King's** expeditions (1826–1836) brought back plants from Chile, Fuegia, etc. These are at Kew, the British Museum, and Edinburgh. *See* "Narrative of the Voyages of

H.M.S. Adventure and Beagle." **Charles Darwin,** under Capt. Fitzroy of the "Beagle," visited Argentina, Chile and Patagonia. In Chile the Magellan Straits, the Chonos Archipelago, Chiloe, Mocha, Concepcion, and Valparaiso were visited and the Cordilleras were crossed south of Santiago. In north Chile Coquimbo, Huasco, Copiapo and Iquique were visited. Darwin was the first to investigate the flora of the eastern part of Fuegia and his plants are at Kew. *See* "Voyage of the 'Beagle'," 1844, and "Geological Observations on South America," 1846.

Eduard Poeppig was professor of zoology at Leipzig. In March, 1827, he landed at Valparaiso, and from then till October he explored the regions round Valparaiso, Santiago and Quillota. The mountains of Chacabuco and the valley of San-Felipe were explored and the Andes crossed to Mendoza, from whence he returned and embarked for Talcahuano (prov. Concepcion). The summer was spent in the Andes round Antuco and in March he returned to Talcahuano. Further explorations were conducted in Peru and Brazil. His plants are at Petrograd, Geneva, Kiel, Leipzig, Vienna, etc. *See* Poeppig and Endlicher, "Nov. Gen. et Sp. Chil. Per." 1827–1832.

C. J. Bertero made a rich collection of plants in Chile. Over 5000 specimens, perfectly preserved and accompanied by descriptions and notes, are at Paris. He was a native of Turin, and landed at Santiago in December, 1827. After travelling through the province of Aconcagua and a great part of North Chile, he passed the winter at Quillota and returned to Valparaiso in November, 1829. He visited Juan Fernandez, and afterwards Tahiti, and was lost at sea. *See* Colla, "Pl. rar. in reg. Chil. a Bert. nuper detectae" and Moris in Mem. Ac. reale delle sc. di Torino, vol. 37–39.

Claude Gay reached Valparaiso in December, 1828, and commenced research near Santiago. In 1830 he conducted systematic investigations in the neighbourhood of Rancagua, San Fernando, the Cordilleras of Cauquenes and Talcarehue climbing the volcano Tunguiritca. Then he traversed the coastline of the province of Colchagua and in the winter of 1831 he was in Copiapo and Coquimbo. He visited Juan Fernandez and returned to Chile in 1834 when he traversed the districts of Melipilla, Casa Blanca, and a part of the province of Aconcagua, and in October, 1834, he went to Valdivia, and later to Chiloe. After his return to Santiago he commenced research in September, 1836, in the province of Coquimbo, the Cordilleras of Santiago and the provinces of Maule and Concepcion. His plants are chiefly at Paris and his great work, "Historia fisica y politica de Chile" is composed of 26 volumes (8 zoology, 8 botany, 6 history, 2 documents, 2 agriculture), and an atlas.

A. Cruckshanks (about 1830) made excursions from Buenos Aires and Mendoza. **J. Gillies** resided (about 1830) several years at Mendoza and made excursions across the Cordilleras up to the Pacific and later across the Pampas to the Atlantic. He explored the heights of Uspallata and the mountains of the provinces of San Luis and Cordoba (Cordova). His plants are at Kew and the British Museum. **J. Baird** collected, in 1829

and 1830, some plants around Buenos Aires (and also in Uruguay).

Arsene Isabelle in February, 1830, reached the Rio de la Plata and landed at Montevideo, from whence he crossed in a few days to Buenos Aires. He visited Porto-Allegro (Brazil) and Uruguay, and apparently did little collecting in the Argentine. **F. J. F. Meyen** during the voyage of the "Prinzess Louise" (1830–1832) visited South America and botanically explored the neighbourhood of Valparaiso and Santiago. He climbed the high Cordilleras of Maypu and San Fernando, and also visited Coquimbo, Huasco and Arica. His book, "Reise um die Erde," was published in two volumes in 1834 and 1835. **B. Hombron** on the expedition of "l'Astrolabe" (1837–1840), under Dumont d'Urville, visited Concepcion and the Magellan Straits. His collections are at Paris and Geneva, and are especially rich in *Compositae*. **The U.S. Expedition** under **Capt. C. Wilkes** (1838–1842) made excursions in the neighbourhood of Valparaiso and Santiago, and a short one to the High Cordillera. *See* Asa Gray, "Botany of the United States Exploring Expedition." **J. Tweedie** collected on the banks of the Rio Plata and in Uruguay, and also south of Buenos Aires, from the Rio Salado up to the Serra de Tendil. His plants were sent to Kew between 1832 and 1849.

Bacle and his widow sent from time to time various plants from Buenos Aires and from the Andes of Argentina to Paris. **Comte Francis de Castelnau** (1843–1847) was in north Chile (and also in Colombia, Ecuador, Bolivia and Peru). The results of his collecting were published by Weddell, in "Chloris andina. Essai d'une Flore de la région alpine des Cordillères de l'Amér. du Sud," Paris, 1855–1857.

The investigations of **J. D. Hooker,** as published in his "Flora Antarctica," are very important. Hooker himself visited Hermite Island in the southern part of our region, and his "Flora Antarctica" includes plants collected by Banks, Darwin, Forster, Gaudichaud, King and others. It was believed by Hooker "that successive expeditions have nearly exhausted the phanerogamic productions" of the Magellanic area ("Flora Antarctica," II. introd.). Some 100 species of flowering plants which were not known in 1844 have, however, been discovered there since.

W. Lechler collected plants in the Magellanic area and in Chile. *See* his "Berb. Amer. austr. Accedit enumeratio plantarum quas in america australi auctor detexit," Stuttgart, 1857.

William Lobb was a collector for Veitch between 1840 and 1857. He first visited Brazil, but soon left for Chile, crossing the great Pampas of Argentina and the Chilean Andes. Continuing his journey southwards Lobb penetrated the great *Araucaria* forests, where he collected a large quantity of seeds of *Araucaria imbricata*, and was thus instrumental in bringing this conifer into general use for ornamental planting. He returned to England in 1844, but the following year went again to Brazil and thence to Valparaiso for the purpose of exploring south Chile. He obtained a rich harvest. Amongst his earliest successful introductions from this region were *Lapageria rosea*, *Escallonia*

macrantha, *Embotherium coccineum*, *Philesia buxifolia*, and *Desfontainea spinosa*. He continued explorations in Valdivia, Chiloe, and northern Patagonia, where he collected seeds and plants of *Libocedrus tetragona*, *Fitzroya patagonica*, *Saxegothea conspicua*, and *Podocarpus nubigena*. *Berberis Darwinii* was first introduced to British gardens during this interesting expedition. *See* "Hortus Veitchianus," p. 37. **Richard Pearce** also collected for Veitch between 1859 and 1866. He was instructed to proceed to Valparaiso and collect in Chile and Patagonia. His particular attention was directed to the collection of seeds of *Libocedrus tetragona*, at that time supposed to be the tree which produced the famous Alerze timber; *Lapageria rosea* and *L. alba*; the Chilean Pine (*Araucaria imbricata*), and other hardy trees and shrubs; secondly, to procure such plants as require a greenhouse temperature; and, thirdly, *Orchidaceæ* and stove and greenhouse flowering plants. Pearce carried out these instructions and, besides the above-named plants, obtained and introduced *Prumnopitys elegans*, *Podocarpus nubigena*, *Eucryphia pinnatifolia*, several species of *Bomarea*, *Thibaudia acuminata*. *Ourisia coccinea*, *O. Pearcei*, and quantities of ferns. At the same time, through his researches, the true Alerze-producing tree was found to be *Fitzroya patagonica* and not *Libocedrus tetragona* as generally supposed. During 1860 Pearce made many journeys to the Cordilleras and the interior of the country, to Los Banos, the Baths of Chillan, and to Los Luganos, etc. His herbarium specimens are at Kew. *See* "Hortus Veitchianus," p. 45.

R. A. Philippi went to Chile in 1851, and in 1853 became professor of zoology and botany and Director of the National Museum. He was settled in Valdivia, and, naturally, studied the vegetation here very fully. He also made excursions from Santiago to the Cordilleras, to the baths of Colina, the Cordilleras of Rancagua and the district between the capital and Valparaiso, the volcano of Chillan, the provinces of Concepcion and Araucania. His very numerous publications appeared in many scientific periodicals.

R. O. Cunningham, during the voyage of H.M.S. "Nassau" (1866–1869), visited the Straits of Magellan and the west coast of Patagonia. *See* his "Notes on the Natural History of Straits of Magellan." This work also contains notes on Chiloe, Lota, Valparaiso, and Santiago.

P. G. Lorentz in 1871–1872 explored the provinces of Cordoba, Santiago del Estero, Tucuman and Catamarca, between 26° and 31° S. lat. The plants he collected were worked out and published by Grisebach in "Plantae Lorentzianae," 1874 (927 Argentine species). Lorentz himself published "Vegetacion del Nordeste de la Provincia de Entre Rios." In 1879 **Lorentz** and **G. Niederlein** accompanied General Rosa on an expedition to the Rio Negro. The plants collected on this expedition are at Buenos Aires and Cordoba. In 1880 Lorentz visited the Sierra de la Ventana. **Lorentz** and **G. Hieronymus** together investigated the flora of the provinces Tucuman, Salta, Jujuy, and Oran; they passed the tropic up to and beyond Tarija, and went by the Rio

Vermejo into the lowlands of the Gran Chaco to the Laguna del Palmar. Their collections are described by Grisebach in "Symbolae ad floram argentinam," 1879, together with collections of Lorentz from Entre Rios and of Hieronymus from the Sierra de Cordoba, and of **Schickendantz** from Catamarca.

Hieronymus returned to his own country in 1884 and was succeeded by **G. Kurtz,** who has explored and collected in Patagonia, up to the pass of la Cumbre, and to the Rio Salado, etc.

George Downton collected for Veitch (1870 1873). In October, 1871, he started on a mission to Chile to collect a further supply of seed of *Embothrium coccineum*, *Tropaeolum azureum*, *T. tricolor*, and other plants of horticultural interest.

Otto Kuntze in his journey round the world (1874–1876) crossed Chile and Argentina. No general account of his South American travels has been found, but a reference to the following paper has been met with: "Botanische Excursion durch die Pampas und Monte-Formationen nach den Cordilleren," in Potonie's Naturwiss. Wochenscritt, No. 1–3, 1893. In his "Revisio Generum Plantarum," vol. iii, a full list of plants is given and the following localities are mentioned: —Chile: Angol. Ercilla; boundary between Chile and Argentina: pass of la Cruz de Piedra (Paso Cruz); Argentina: Tucuman and Cordoba: Patagonia: Santa Cruz.

Several expeditions have casually touched Chile—*e.g.*, the Austrian "**Donau**" (1868–1871), and the "**Challenger**" (1872–1876). The expedition of the "**Gazelle**" (about 1880) worked in the Magellan Straits, and was accompanied by the botanist **Naumann,** who collected some plants. *See* Engler's Bot. Jahrb. Bd. 4–6.

The French doctors, **Savatier, Hariot,** and **Hyades** (1877-1879) made important collections in the south. *See* Franchet, "Mission scientifique du Cape Horn." P. A. L. Savatier's collections are at Kew, and an account of his life and travels is given in the *Kew Bulletin*, 1909, p. 148.

John Hall traversed the Chilean coast-belt from Arica to the Magellan Straits, and an account of his tour is given in his book. "Notes of a Naturalist in South America," London, 1887. **Gussfeldt,** in 1882, travelled in the Cordilleras of Central Chile. *See* his book, "Reise in den Anden," Berlin, 1888.

F. Philippi, son of R. A. Philippi, accompanied his father on many excursions, and also made many of his own in the coast Cordilleras of Valdivia, in the province of Tarapaca (1884–1885), the northern forest regions of Chile (1883), and Atacama (1885). **Carlos Reiche** has made journeys into South Chile and other parts. The first volume of his "Flora de Chile" was published (in Spanish) in 1896, and the work is not yet completed. His excellent work on the phytogeography of the country was published in Engler and Drude, "Vegetation der Erde," vol. 8, 1907. This latter work is in German.

Wilczek (1897) crossed the Andes and collected plants at Saint Raphael and in the valley of the Atuel. *See* Chodat and Wilczek in Bull. Herb. Boiss. ii. ser., vol. ii. p. 281, 1902, and Briquet in Ann. du Conserv. et du Jard. bot. de Genève, 1900, p. 14.

The Argentine botanist, **C. Spegazzini,** has explored many parts of Argentina and also (1881) Eastern Fuegia. He has, for the most part, published the results of his own researches. His herbarium, which is particularly rich in Cryptogams, is at La Plata.

The Princess Therese von Bayern in 1898 made a journey in Chile and collected plants from the coastal districts, from Antofagasta to Coquimbo, and from the Cordilleras, near the Uspallata Pass. In Argentina she travelled from the Uspallata Pass to Mendoza, and thence to Buenos Aires (*See* Beih. Bot. Centrlb. xiii, p. 1, 1902–3).

N. Alboff has also studied the flora of South Fuegia (1896). **P. Dusen** (1895–1896) investigated the flora on both sides of the Magellan Straits. The results include the publications of 27 new species (largely *Compositae*, *Leguminosae*, and *Gramineae*). **Hatcher** in 1896 and 1897 visited parts of southern Patagonia, and **Nordenskjold,** in 1898, explored from Punta Arenas to Ultima Esperanza, both making botanical collections. For the work of **Skottsberg,** see a summary by the writer in the *Kew Bulletin*, 1919, pp. 268–279.

E. A. FitzGerald was accompanied by **Philip Gosse** in his exploration of parts of the Andes. Gosse collected in the Las Cuevas and Horcones valleys a number of plants which were named by I. H. Burkill, and are now at Kew. *See* FitzGerald, "The Highest Andes," pp. 370 seq., 1899.

H. J. Elwes (1901–1902) collected plants and seeds in a "number of scattered localities belonging to different phytogeographical areas" in Chile and Argentina. His plants are at Kew.

Robert Fries accompanied the Swedish Chaco-Cordillera Expedition (1901–1902), which explored the mountains and high plateaux of the northern provinces of Argentina, especially the province of Jujuy. His plants are partly at Upsala, partly at Stockholm. *See* his work, "Zur Kenntnis der alpinen Flora im nordlichen Argentinien," Upsala, 1905.

In recent years a considerable amount of botanical work has been done by naturalists residing in Chile and Argentina. The work of the Philippis, Reiche, and Spegazzini has been referred to above. Others who should be mentioned are **Echegaray,** who studied the flora of parts of San Juan, **Ave. Lallemand,** who worked in San Luis, and **Boman** in the province of Buenos Aires, particularly at Chacabuco.

E. L. Holmberg has published (1898) a "Flora de la Republic de la Argentina," but this is a general phytogeographical account (in Spanish), and no complete systematic flora of Argentina has appeared. **Reiche's** "Flora de Chile" is purely systematic.

Reference may be made to **Capt. A. W. Hill's** paper, "South America in relation to Horticulture," in the Journal of the Royal Horticultural Society, October, 1911, p. 51, and to the illustrated guide by **C. Thays,** "El Jardin Botànico de Buenos Aires," 1910.

A new work by **Lucien Hauman,** published in 1919, and entitled, "La Végétation des Hautes Cordillères de Mendoza," deals with the flora ecologically, phytogeographically and

systematically. The general part (in French) is extremely interesting reading.

The principal herbaria in Argentina are in the Museum of Cordoba, including types of Grisebach, Lorentz and Hieronymus, and greatly enriched by Kurtz, Niederlein, Holmberg, etc., at La Plata (Spegazzini's plants, etc.) and at Tucuman, where is the herbarium of Miguel Lillo, which is particularly rich in plants of the sub-tropical formations.

The principal herbaria in Chile are in the Museo Nacional, Santiago, and the Museo de Historia Natural, Valparaiso.

REGIONS IN THE ARGENTINA OR CHILE WHICH ARE RELATIVELY UNEXPLORED BOTANICALLY.

The compilation of an account of the botanical exploration in Chile and Argentina has brought out one point very strongly: that Argentina and the Argentine side of the Andes have been much less visited, especially by horticultural collectors, than Chile and the Chilean Andes. This is probably explicable, in part at least, by the fact that the mountains are so much nearer the west than the east coast.

In Argentina the Territory of the Neuquen (Gobernacion del Neuquen) seems the least explored of the southern Andine provinces and might yield some hardy horticultural novelties. The Buenos Aires Great Southern Railway runs from Buenos Aires as far as Senillosa, a little west of Neuquen (1919 map) in the east of the province, and it is projected to carry it to the western frontier. From Senillosa exploration south-west towards the sources of the river Limay and its tributaries and north-west towards the sources of the river Neuquen and its tributaries should yield a great many interesting and new plants. South of the latitude of Chiloe a considerable amount of work has been done and the flora is less rich. The provinces of Mendoza (north of Neuquen) and San Juan have been visited by several botanists. The northern Andine provinces of Catamarca and Jujuy and the territory of Los Andes would certainly yield many new plants, but these, except on the higher mountains would tend for the most part to be of a more sub-tropical character. The northern and north-eastern province of Salta, the territories of Formosa, Chaco and Misiones, and the provinces of Corrientes have apparently been little explored botanically and certainly very little visited by European collectors. The flora is here sub-tropical. The central provinces (Buenos Aires, Cordoba, Santa Fé, San Luis, and the Territory of the Pampas) have been relatively well worked, but even in these there must be many species of horticultural value which have never been introduced into Europe. In the southern provinces (territories of the Rio Negro, of the Chubut and Santa Cruz, *i.e.*, "Patagonia") there is a poorer flora and few good lines of communication.

Chile, with its long coast-line, narrow width and many ports, may be said to have been well explored, and it is difficult to give preference to any of the provinces. Certainly, whatever part of the Andes might be visited, some plants new to European horticulture could be obtained, but the desert northern provinces of

Tarapaca and Antofagasta, and the region of the Llanquihue lakes, appear to have been less visited than most districts.

To sum up: the impression obtained by the studies detailed above is that the two areas most likely to provide a large number of new plants are: (1) the territory of the Neuquen (hardy plants), and (2) the province of Jujuy (sub-tropical and montane plants).

IX.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XCV.

941. **Stellaria Wallichiana,** *Haines* [Caryophyllaceae Alsinoideae Alsineae]; species *S. mediae*, Vill., et *E. neglectae*, Weihe, affinis; ab his sepalis petalisque 4, sepalis ovatis sine marginibus scariosis, petalis saepe potius emarginatis quam 2-fidis, foliis omnibus petiolatis basi late subcordatis sed versus petiolum cuneatis differt.

Herba tenuis, procumbens, caulibus pubescentibus pilis eglandulosis plus minus in duas lineas confertis atque pilis glandulosis dispersis. *Folia* omnia petiolata, ovata vel ovato-lanceolata, 1-2·5 cm. longa, basi late cordata, in petiolum autem cuneata; petiolus tenuis, pubescens. *Flores* solitarii, pedicellis bis vel quinquies quam sepalis longioribus. *Sepala* 4, ovata, interdum subito acuminata, 2·5-3 mm. longa. *Petala* 4, ovata, 2-fida vel solummodo emarginata. *Stamina* hypogyna. *Ovarium* ovoideum, stylis 2–3 recurvatis. *Capsula* sepalis brevior, (4?) 6-valvis. *Semina* 3–12, muricata (non granulata ut in *S. media*, Hook. f.) *Alsinella Wallichiana*, Benth. in Wall Cat.; *S. media*, Hook. f. Fl. Brit. Ind. partim.

INDIA. Sylhet, Wallich 630; Bengal Rungpore, *Clarke* 26320, Purneah, *Haines* 5161. In damp places.

942. **Aspidopterys Hutchinsonii,** *Haines* [Malpighiaceae]; species *A. obcordatae*, Hemsl., arcte affinis sed paniculis brevibus densioribus, pedicellis fructiferis brevioribus, sepalis dorso pubescentibus, samararum nervis paucioribus minus reticulatis distinguitur.

Frutex scandens, caulibus pilorum delapsorum cicatricibus asperis juventute lanuginosis. *Folia* orbiculari-obovata, subito cuspidata, 7-11 cm. longa, saepe latiora, basi truncata vel rotundata, non cordata, apice praeter cuspidem obtusissima vel leviter retusa, juventute utrinque dense flavo-tomentosa, maturescentia subtus hirsuto-pubescentia, supra glabrescentia; nervi laterales circa 4-5 quorum unus prope basem. *Petiolus* circa 2 mm. longus. *Paniculae* breves (nostris in exemplis foliis breviores), ferrugineo-pubescentes; pedicelli circiter 1·5 cm. longi, 3 mm. supra basem articulati, infra articulationem hirsuti, supra articulationem fere glabri vel glabri. *Sepala* oblongo-lanceolata, 1·4 mm. longa, dorso longe pubescentia. *Petala* oblonga vel elliptico-oblonga, 4·5–5 mm. longa. *Stamina* petalis multo breviora,

glabra. *Ovarium* glabrum, minute alatum. *Samara* ut in *A. obcordata*, Hemsl., sed nervi laterales plus distincti, minus reticulati et carpophorium acuminatum, 4 mm. longum.

India. Orissa; mountains of Mayurbhanj, *Haines*.

This species might perhaps be considered as an extreme western form of *A. obcordata*. In the type of that species the leaves are cordate both at the base and at the apex; examples from Siam are only cordate at the base, while some Burmese specimens show some leaves cordate at the base, others rounded and with the apex either slightly retuse or even obtuse. In all these, however, the sepals are glabrous and the panicles large and lax.

943. **Tetrastigma alcicorne,** *Haines* [Ampelidaceae-Vitoideae]; species *T. lanceolariae*, Planch., *T. Thomsonianae*, Planch., *T. bracteolateae*, Planch., affinis; ab omnibus foliorum rhachi longa, extremo foliolo obovato subito acuminato, petalis neque cucullatis nec calcaratis, ab unoquoque aliis characteribus differt.

Frutex scandens, caulibus paulum complanatis glabris, cirris foliis oppositis simplicibus. *Folia* trifoliolata, nitentia, glabra, rhachi cum petiolo extremo 2–3 cm. longo, petiolo 5–8 cm. longo; foliola 8–10 cm. longa, in parte superiore leviter crenata denticulataque, obtusa, subito caudata, foliolo extremo obovato, nervis lateralibus utrinque 4–6. *Cymae* 2·5–6·5 cm. longae, petiolis breviores vel iis aequilongae, puberulae, sessiles vel brevissime pedunculatae, ramulis, saepe complanatis atque sursum gradatim latioribus (alcis cornubus similibus). *Bracteae* 1·3–1·6 mm. longae. *Flores* dioici, tetrameri, viridi-albi, 1·3 mm. longi. *Calyx* patelliformis, vix vel leviter 4–lobatus. *Petala* oblongo vel lanceolato-oblonga, puberula, in mediis concava, apicibus patentibus minute mucronatis vel muticis; discus obscurus. *Stigma* latum, lobis 4 distinctis acutis vel obtusis. *Fructus* non visus.

India. Champaran; near the Nepal Hills, *Haines*, 3961.

944. **Oldenlandia anamalayana,** *Gamble* [Rubiaceae-Hedyotideae]; *O. Lessertrinae*, O. Kze., affinis sed minor, foliis tenuioribus haud plicatis, floribus minoribus in cymulas parvas dispositis nec umbellatis, pedicellis gracilibus bracteolatis.

Arbuscula glabra, ramulis tetragonis, ultimis compressis. *Folia* lanceolata, acuminata, 7–11 cm. longa, 2–4 cm. lata, nervis utrinque 5–7 obliquis parallelis supra impressis; petiolus 1–1·5 cm. longus; stipulae inferiores tubulosae, marcescentes, ad 1 cm. longae, dentibus paucis subulatis, superiores ad basim fissae, inde triangulares, dentatae, omnes scariosae. *Flores* parvi, in cymarum paniculis corymbosis terminalibus vel in cymis e nodis ultimis pedunculatis; pedunculi 1–1·5 cm. longi; pedicelli graciles, 2 mm. longi; bracteae foliaceae, lanceolatae; bracteolae lineares, minutae. *Calycis* limbus campanulatus, 1 mm. longus, dentibus minutis ovatis. *Corollae* tubus cylindricus, 4 mm. longus; lobi lanceolati, intus ad tubi faucem barbati, patentes vel recurvi. *Stamina* exserta, filamentis longis, antheris medio affixis oblongis. *Stylus* gracilis, stigmatibus 2 linearibus. *Capsula* dicocca, circiter 2 mm. longa, in quodam cocco placentae

oblongae, seminibus paucis. *Hedyotis Lessertiana*, Beddome Icones Plant. t. 31, non Arnott.

South India. Anamalai hills, in higher ranges, *Beddome* in Herb. Madr., coll. 1872.

This seems to be distinct from *O. Lessertiana* and to be the plant figured by Beddome, which figure Trimen refused to quote as "scarcely appearing to represent any form of this species" (*Hedyotis Lessertiana*, Arn., Trimen Fl. Ceylon, ii. 309).

945. **Oldenlandia Barberi,** *Gamble* [Rubiaceae-Hedyotidieae]; species distincta, lignosa, facie *O. buxifolium*, O. Kze., et *O. quinquenerviam*, O. Kze., ob folia parva ad apices ramulorum congregata referens, ab utraque specie cymis trifloris sessilibus axillaribus et stipulis non pectinatis differt.

Arbuscula lignosa, ramulis didi-vel trichotomis curvatis griseis cicatricibus foliorum delapsorum notatis. *Folia* ad apices ramulorum congregata, percoriacea, ovata, apice obtuse acuta, basi obtusa et decurrentia, margine conspicue incrassata, 2–3 cm. longa, 1–1·5 cm. lata; costa crassa, nervis utrinque 4–5 obliquis perobscuris; petiolus haud ullus; stipulae orbiculares, margine glandulis nigris ornatae et intus ad medium glandularum annulo notatae, conspicue marcescentes albidae. *Cymae* axillares, triflorae, bracteolis 2 subulatis ad basim ornatis, pedicellis brevibus 2–3 mm. longis. *Calycis* tubus infundibularis, lobis 4 lanceolatis acuminatis glabris 2 mm. longis. *Corollae* tubus cylindricus, 3 mm. longus; lobi ovati, acuti, 3 mm. longi, fauce paullo puberuli. *Stamina* vix exserta, subsessilia, antheris oblongis. *Stylus* simplex, stigmatibus 2 parvis brevibus. *Capsula* glabra, non protrusa, seminibus paucis.

South India. Agastiamalai peak, on the boundary between Travancore and Tinnevelly, at about 1500 m. alt., May, 1901. *C. A. Barber* 2926.

946. **Knoxia linearis,** *Gamble* [Rubiaceae-Knoxieae]; *K. Wightianae*, Wall., affinis, sed pubescens, foliis angustioribus linearibus, stipulis elongatis pubescentibus et mericarpiis vix separantibus differt.

Herba perennis, erecta, pubescens, ramis multis gracilibus teretibus, e caudice lignoso. *Folia* sessilia, linearia vel aliquando lineari-lanceolata, ad 6 cm. longa, 3–8 mm. lata, nervis utrinque circiter 5 perobliquis scabris; stipulae ovatae, acuminatae, margine pinnatisectae, 2 mm. longae. *Flores* in corymbis terminalibus racemiferis di-trichotomis ad 4 cm. longis. *Calycis* tubus brevis, campanulatus; lobi breves, unus longior. *Corollae* tubus anguste infundibularis, 3 mm. longus, intus parce villosus; lobi breves in alabastro incurvi, demum patentes. *Stamina* exserta; filamenta e fundo corollae tubi gracilia; antherae oblongae. *Stylus* gracilis, stigmatibus 2 ovatis. *Fructus* ovoideus, mericarpiis 2 connatis vix separantibus, facile integer a columella centrali persistente solutus; pericarpium membranaceum, siccitate rugosum.

South India. Mahendragiri hills in Tinnevelly District, September 17, 1916. *K. Rangachari* 13168.

947. **Jasminum Parkeri,** *Dunn* [Oleaceae] *J. humili*, Linn., affinis sed floribus solitariis distincta; *J. fruticanti*, Linn., etiam similis sed calycis dentibus multo brevioribus et pubescentia differt.

Frutex 15–30 cm. altus. *Ramuli* intricati, striati, cum foliis calycibusque puberuli. *Folia* alterna, coriacea, 3–5 foliolata, 1–2 cm. longa; foliola ovata, obtusa, obscure mucronata, 3–6 mm. longa. *Flores* terminales et axillares solitarii; bracteae minutae; pedunculi calyce breviores. *Calyx* 2–3 mm. longus, urceolatus; tubus 5-costatus, dentibus subulatis bis longior. Corolla 2–3 cm. longa, aureo-flava, lobis tubo bis brevioribus. *Bacca* didyma, carpellis 3 mm. diametro ellipsoideis, albido-viridibus, translucentibus.

India. Chamba State: lower part of upper basin of the Ravi; Tiari, Barmaor, on dry ground among boulders, 800 m. *R. N. Parker*, July, 1919. (Fl. June.) Mr. Parker notes its occurrence in other places in the same valley.

948. **Pseuderanthemum Dawei,** *Turrill* [Acanthaceae-Pseuderanthemeae]; affinis *P. elliptico*, Turrill, sed foliis majoribus, inflorescentia paniculata, calyce minore segmentis membranaceis, corolla infundibuliformi distinguitur.

Herba erecta, caulibus teretibus inferne glabris vel leviter puberulis superne hirsutis. *Folia* elliptica, apice gradatim acuminata, basi in petiolum 1·2 cm. longum angustata, usque ad 16 cm. longa et 5·7 cm. lata, costa in pagina superiore sulcata, inferiore prominente, nervis lateralibus utrinque circiter 10–12 in pagina utraque prominentibus marginem versus sursum curvatis, nervis tertiariis subparallelis, supra glabra, infra in costa nervisque puberulis alioqui glabra. *Inflorescentia* paniculata, 1·6 dm. longa, multiflora, puberula; bracteae lineari-lanceolatae, 2·5 mm. longae; bracteolae vix 1 mm. longae; pedicelli 1·5–2 mm. longi. *Calyx* fere ad basem 5-fidus, segmentis lanceolatis acutis 3 mm. longis membranaceis extra puberulis. *Corolla* anguste infundibuliformis, extra glanduloso-puberula, tubo 8 mm. longo basi 1·3 mm. fauce 2·3 mm. diametro, lobis subaequalibus elliptico-ovatis 6 mm. longis 4 mm. latis, abaxiali leviter latiore. *Stamina* fertilia duo 3 mm. supra tubi basem inserta, filamentis 0·5 mm. longis, antheris 1 mm. longis; pollinis granula ellipsoidea 32 μ longa 25 μ diametro. *Discus* brevissimus. *Ovarium* cylindricum 1·5 mm. altum, 0·75 mm. diametro, minutissime puberulum; stylus 3 mm. longus, inferne patule puberulus.

Colombia: Cauca Valley, fl. April, *M. T. Dawe* 847.

949. **Pseuderanthemum ellipticum,** *Turrill* [Acanthaceae-Pseuderanthemeae]; species *P. lanceo*, Turrill, comb. nov. (*Eranthemo lanceo*, Nees), valde affine sed foliis ellipticis vel elliptico-oblanceolatis basi gradatim angustatis, in pagina utraque glabris, calycis lobis longioribus, corolla hirsutiore differt.

Herba erecta, caulibus teretibus inferne fere glabris superne leviter hirsutis. *Folia* elliptica vel elliptico-oblanceolata, apice acuminata, basi in petiolum plus minusve 1 cm. longum gradatim

angustata, usque ad 8 cm. longa, et 2·6 cm. lata, in pagina utraque glabra, costa in pagina superiore sulcata, inferiore prominente, nervis lateralibus utrinque circiter 8 infra prominentibus supra subprominentibus, nervis tertiariis reticulatis. *Inflorescentia* fere spicata, hirsuta, usque ad 1·6 cm. longa; bracteae lanceolato-lineares, 4 mm. longae; bracteolae subulatae, 1·5 mm. longae: pedicelli brevissimi. *Calyx* fere ad basem 5-fidus, segmentis lanceolato-linearibus acutis 6 cm. longis dense glandulose-hirsutis. *Corolla* alba, extra dense hirsuta, tubo cylindrico in parte superiore leviter ampliato 1 cm. longo basi 1·3 mm. fauce 2 mm. diametro, lobis subaequalibus 6·5 cm. longis 3-4·5 cm. latis. *Stamina* fertilia duo 7 mm. supra tubi basem inserta, filamentis 1 mm. longis, antheris 2 mm. longis; pollinis granula ellipsoidea 52 μ longa 32 μ diametro. *Discus* inconspicuus, vix 0·5 mm. altus. *Ovarium* cylindricum. 2 mm. altum, 0·75 mm. diametro, minutissime puberulum; stylus 1·1 cm. longus, inferne hirsutus.

Colombia. Fusagasuga, white hedgerow flower in lanes and paths between coffee plantations, fl. April, *Mrs. J. A. Tracey* 24: Arizal, in forest shade. 1700 m., fl. May, *Kalbreyer*.

950. **Lasiococca Comberi,** *Haines* [Euphorbiaceae-Acalypheae]; affinis *L. symphylliaefoliae* Hook. f., sed foliis multo latioribus, floribus feminis saepe subcorymbosis nec glandulosis, sepalis exteris fructiferis brevioribus latioribus, capsula matura tuberculata, tuberculis uno aut ad summum duobus pilis simplicibus exceptis glabris, differt.

Arbor parva, trunco erismis instructo cortice pallido, ramulis albis juventute dense pubescentibus. *Folia* subverticillata, obovata vel elliptica, acuminata, basi cordata, 9–20 cm. longa, 4·5-6·5 cm. lata, glabra, nervis lateralibus 10–30 utrinque, petiolo tomentoso brevissimo. Racemi ♂ 3–6 cm. longi, axillares (etiam in foliorum delapsorum axillis); rhachi pedicellisque pubescentibus: bracteae 3 mm. ovatae, obtusae; pedicelli articulati, 3–5 mm. longi. *Calyx* in alabastro apice extremo pubescens, ceterum glaber; sepala circa 7 mm. longa, elliptica v. elliptico-oblonga. Pedunculi ♀ pubescentes, non-glandulosi, 1·6-2·5 cm. longi, ramulorum versus apices axillares vel ad perularum deciduarum axillas subcorymbosi, bracteis parvis 1–2 lanceolatis instructi. *Sepala* inaequalia, exteriora late ovata, subito acuminata, paucis ciliolis exceptis glabra. *Ovarium* leviter trilobum, minute squamatum vel tuberculatum, tuberculis apicibus 1–2 setis simplicibus instructis; styli extus leviter setulosi. *Capsula* triloba, circa 1·2–1·3 cm. diametro, tuberculata, demum glabra. *Semina* brunnea, globosa.

India. Orissa: Angul: in rocky ravines of the mountains of Mayurbhanj, *Comber*.

This species is named after Mr. Comber, of the Indian Forest Service, who kindly visited one of the localities in Angul, where it grows, until he had collected all stages of the flower and fruit. By the specimens thus obtained I am now able to supplement and slightly modify the description of the genus as originally published in Hooker's Icones (Vol XVI, 1887, Pl. 1587).

Lasiococca, Hook, f. Flores monoici vel dioici, apetali, ♂ racemosi, racemis lateralibus, ♀ solitarii, pedunculati, axillares v. subcorymbosi ad ramulorum novorum apices. Fl. ♂: Calyx globosus, valvatim tripartitus. Discus 0. Stamina perplurima, centro floris inserta, antheris in phalanges ramosissimas dispositis, loculis globosis subdivaricatis, connectivo loculos cingente. Pistillodium 0. Fl. ♀: Sepala 5–7 inaequalia, persistentia et aliquantum accrescentia. Ovarium globosum vel leviter 3-lobum; styli 3, filiformes, erecti, intus stigmatosi. Ovula in loculis solitaria. Capsula demum 3-cocca; cocci a triquetra columella decidui, dehiscentes, setis crassis spiculiferis vel tuberculis operti. Semina subglobosa laevia, testa tenuiter crustacea; hilum latum; raphe linearis; caruncula 0. Albumen carnosum. Cotyledones magni, orbiculares, subcordati, plani, tenues. Folia subverticillata, rarius alterna v. subopposita, breviter petiolata, oblanceolata vel obovata, acuminata, basi cordata, integerrima.

Species 2, Indiae Orientalis incolae.

X.—MISCELLANEOUS NOTES.

Mr. M. Vardy, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent of Agriculture, Grenada.

Dr. John H. Wilson.—It is with great regret that we have learnt of the death of this well-known agriculturist who, since 1900, was Lecturer in Agriculture and Rural Economy in the University of St. Andrews. Some particulars of his life and work are given in the obituary notices that appeared in the "Gardeners' Chronicle" for 31st January, 1920, p. 59, and in "Nature" for 22nd January, p. 539. Dr. Wilson was a native of St. Andrews, and died there after a short illness on 13th January at the age of 61. He was the first Botanical Lecturer in the University, and laid out its original Botanic Garden; he was also, for some time, Demonstrator in Zoology. His most important work, however, was directed to the improvement of the potato and other important food plants. Of the potato he was successful in raising several fine varieties which have become well-known.

In the note on presentations to the library, published in the *Kew Bulletin*, 1913, p. 62, reference is made to a thick foolscap-folio volume of manuscript and printed matter relating to the Royal Botanic Gardens, Kew, once the property of John Smith, Curator of the Gardens from 1841 to 1864, who was the author of a considerable portion of it. The establishment is indebted to Dr. Wilson for this interesting accession, which was the subject of a note by Dr. Hemsley in the *Bulletin* for 1914, p. 85.

Taiwania cryptomerioides, *Hayata.*—A healthy young plant of this new and very interesting conifer was received in December last from the Arnold Arboretum. It is one of a few living plants introduced to that institution by Mr. E. H. Wilson during his recent visit to Formosa. Seeds also were collected by Mr. Wilson and widely distributed by the Arboretum, but of those received at Kew not one germinated; nor have we learnt that any better result has been obtained elsewhere. It seems, therefore, that the plant just received will represent the first introduction of this tree in a living state to Britain.

Taiwania cryptomerioides was originally described by Hayata in the Journal of the Linnean Society, vol. xxxvii. p. 330 (1906), plate xvi. It appears to have been first discovered on the western slope of Mount Morrison in Formosa, at about 6500 feet elevation. There are some very good cone-bearing shoots preserved in the Kew Herbarium, collected in 1912 by Mr. W. R. Price. The tree has two distinct types of foliage—juvenile and adult. The young plant at Kew has nothing but the former, the leaves being awl-shaped, flattish but slightly thickened up the middle, $\frac{3}{8} - \frac{1}{2}$ inch long, $\frac{1}{16}$ inch wide at the base, tapering gradually to the slender, sharply-pointed apex. Several lines of stomata on each surface give the leaves a greyish tinge. At this stage the leaves in shape and arrangement strongly suggest *Cryptomeria.* On the adult, cone-bearing shoots the leaves are quite different, and in shape, size and arrangement are very like those of *Athrotaxis laxifolia*; they are only $\frac{1}{8}$ inch long, stout, keeled at the back, incurved and bluntish at the apex. The cones are oval $\frac{3}{8} - \frac{1}{2}$ inch long, the scales roundish-obovate, $\frac{1}{8} - \frac{3}{16}$ inch wide. In structural detail Hayata observes that the cones most nearly approach those of *Cunninghamia.* In external appearance they suggest small cones of *Tsuga.*

According to a note in the Journal of the Arnold Arboretum. vol. i, p. 66, the *Taiwania* is the tallest tree in the world outside California and Australia and is, in its young state, one of the most beautiful of all conifers. It will have to be grown in the Temperate House at Kew, and is only likely to be hardy in this country in the south-western counties, the Scilly Isles and similarly mild localities.

W. J. B.

Bluff et Fingerhuth, Compendium Florae Germaniae. ed. 2.—The first section of Bluff and Fingerhuth's Compendium, ed. 1, comprising the Phanerogams, appeared in 1825, under the auspices of C. G. and Th. Fr. Nees ab Esenbeck,* and in spite of rather unfavourable criticism† seems to have met a definite want‡ and received sufficient support to warrant the publication of a second edition.

The second edition, edited by Bluff, C. G. Nees and Schauer, appeared in 1836–8, and was very favourably noticed, the reviewer

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* Flora, 1825, i. Beilage, pp. 90–93.
† *Ib.*, ii. pp. 714–718.
‡ *Ib.*, ii. pp. 640, 685.

stating that it was the most complete flora of Middle Europe, and the only one arranged according to the Linnean system.*

In 1837, however, W. D. J. Koch published his Synopsis Florae Germanicae et Helveticae, which at once became the standard work on the subject, passing through three Latin and three German editions, the latest of which appeared in 1892–1907.

The second edition of Bluff and Fingerhuth's Compendium was thus immediately superseded, and passed into oblivion. As showing how little it was consulted by botanists of the day, it may be mentioned that Sir W. J. Hooker's copy was still uncut at the date of his death.

Though the immediate success of Koch's Synopsis was due mainly to its high intrinsic merits, it was undoubtedly helped by his adoption of the Candollean system of arrangement in preference to the Linnean, which had at that date become obsolete, except for the purposes of a clavis, for which it still has its uses.†

The second edition of Bluff and Fingerhuth's Compendium does not appear to have been consulted during the compilation of the Index Kewensis, which consequently does not contain the following names proposed by Bluff, C. G. Nees and Schauer. These will be included in the sixth supplement of the Index.

NAMES PUBLISHED IN BLUFF ET FINGERHUTH, COMP. FL. GERM., ED. 2, WITH THEIR MODERN EQUIVALENTS.

Alsine banatica, l.c. i. pars 2, p. 99 (1837) = Minuartia setacea, var. banatica, *Hayek*.

Alsine graminifolia, l.c. 96 = Arenaria graminifolia, *Schrad*.

Armoracia austriaca, l.c. ii. p. 27 (1838) = Nasturtium austriacum, *Crantz*.

Armoracia glastifolia, l.c. 26 = Cochlearia glastifolia, *Linn*.

Avena Cavanillesii, l.c. i. pars 1, p. 143 (1836) = Trisetum Cavanillesii, *Trin*.

Critamus ammoides, l.c. 513 = Ptychotis ammoides, *Koch*.

Critamus latifolius, l.c. ii. p. 751; index, p. 46 (1838) = Falcaria latifolia, *Koch*.

Diplotaxis arvensis, l.c. ii. p. 103 = Moricandia arvensis, *DC*.

Eleocharis alpina, l.c. i. pars 1, p. 92 (1836) = Scirpus alpinus, *Schleich*.

Eleogenus Lereschii, l.c. ii. p. 746 (1838) = Scirpus atropurpureus, *Retz*.

Erianthus strictus, l.c. i. pars 1, p. 105 (1836) = Erianthus Hostii, *Griseb*.

Erucastrum balearicum, l.c. ii. p. 101 (1838) = Brassica Robertiana, *J. Gay*.

Isolepis australis, l.c. i. pars 1, p. 82 (1836) = Scirpus Holoschoenus, var. australis, *Koch*.

Isolepis exserens, l.c. 81 = Scirpus Holoschoenus, var. australis, *Koch*.

Isolepis filiformis, l.c. = Scirpus Holoschoenus, var. filiformis, *Aschers. et Graebn*.

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* Flora, 1839, i. Intelligenzbl. p. 43.

† Prain, Bengal Plants, i. pp. 21–164 (1903).

Isolepis Linnaei, l.c. 82 = Scirpus Holoschoenus, var. Linnaei, *Aschers. et Graebn.*

Lepigonum segetale, l.c. i. pars 2, p. 92 (1837) = Spergularia segetalis, *Fenzl.*

Lobularia halimifolia, l.c. ii. p. 13 (1838) *vice L. halimifolia*, Steud. (1841.)

Moehringia sphagnoides, l.c. i. pars 2, p. 102 (1837) = Moehringia ciliata, var. nana (*Gaud.*).

Ranunculus calthaefolius, l.c. 295 vice *R. nudicaulis*, Rouy et Fouc.

Sorbus sudetica, l.c. 178 vice *S. sudetica*, Nyman (1879).

T. A. S.

Flora of Sweden.* Under the authorship of Dr. C. A. M. Lindman, a useful work on the flowering plants of Sweden has just come to hand. It is published in a practical form which should commend itself to students of the Scandinavian flora. A most useful feature is a large number of well-drawn and tastefully-arranged black-and-white text figures which, used in conjunction with the keys to genera and species, should make identification easy even to the inexperienced botanist. It seems a little quaint, though altogether charming considering the subject, to be confronted at the beginning of the work with a family key based on Linnaeus' artificial sexual system. For instance, the figures illustrating the genera of "Klass 2, *Diandria, Monogynia,*" associate such a motley of types as *Veronica, Utricularia, Lepidium, Coronopus, Lemna* and *Cypripedium*. The families are arranged after Engler's system. Dr. Lindman has had the assistance of several specialists, whose names appear in the elaboration of such typical Scandinavian genera as *Hieracium* and *Taraxacum*, and in the case of *Rubus, Rosa, Salix* and a few smaller genera. Compared with *Rosa* (by S. Almquist), 205 species, and *Taraxacum* (by Dahlstedt), 99 species, the genus *Hieracium* (by Dahlstedt) seems surprisingly small with only 89 species.

J. H.

Flora arabica.†— In this compilation Father Blatter begins to bring together the citations, synonyms, and such collectors' records as were available of all the plants known in Arabia. There has been no complete Flora of the district published since 1775 when Forskal's *Flora Aegypto-Arabica* appeared, and anyone determining plants from this large area had to undertake considerable research before the works of the various authors concerned could be consulted. Now we have the Flora brought up to date and can approach the subject with some confidence, as the work has been carefully done.

The sequence of orders and genera follows Bentham and Hooker's *Genera Plantarum*, the present part dealing with *Ranunculaceae-Moringaceae*. In the next part we are promised

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* C. A. M. Lindman, Svensk Fanerogamflora, pp. 639. Stockholm, 1918.

† Flora Arabica, Ethelbert Blatter, S.J., F.L.S., Part i. Records of the Botanical Survey of India, viii. 1–123.

a map showing the phyto-geographical divisions, and the author has notes on the history of botanical exploration in Arabia and a general sketch of the vegetation which he hopes to deal with at the end of the list.

In a country like this, where the months of flowering and fruiting depend so much on the dates of the rare falls of rain, and where even rainless years occur, the author has properly included the years as well as the months in which each species flowered or fruited. S. T. D.

The Flora of Madras, Part III.—The issue of the first and second parts of the Flora of Madras has been already noticed in the *Kew Bulletin*, 1916, pp. 57-65, and 1918, pp. 222-228. The present contribution commences with a continuation of the *Leguminosae* begun in part ii, and closes with *Caprifoliaceae*. This arrangement, though making the part a little smaller than those which preceded it, is convenient in leaving the next one to begin with the important order *Rubiaceae*, and will probably enable botanists to have this and the *Compositae* complete in the same bound volume. The inclusion in this part of such important woody orders as *Combretaceae* and *Myrtaceae* will render it of special value to foresters. The author's well-known acquaintance with the trees of the district under forest conditions, added to an exact botanical treatment of the subject, will make the pages devoted to such genera as *Terminalia* of great practical use.

One of the most valuable parts of these local Indian floras has been the inclusion of good keys to orders, genera and species. Their construction requires a wide and accurate knowledge of the living plants, coupled with discretion and patience. S. T. D.

Identification of the Economic Woods of the United States.*—This work was originally undertaken with the view that it might be accepted as a text-book for forestry students and others interested in the study and identification of woods, the subject matter being selected by the author from the notes used by him in a series of lectures on Forest Products given at the Yale Forest School. The first edition appeared in 1912, and the present volume, while including all the salient points of the original work, brings up to date the knowledge of United States woods gained since that time. As a good deal of research work on the structural and physical properties of United States woods has been carried out in the intervening years, it necessitated rewriting and rearranging the key, whilst advantage has been taken of the opportunity of adding to the number of woods described, and of including references to literature on the subject which has appeared during the last few years.

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* Identification of the Economic Woods of the United States, including a discussion of the Structural and Physical Properties of Wood, by Samuel J. Record, M.A., M.F., Professor of Forest Products, Yale University, 2nd edition, revised and enlarged. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, 1919. Price 8s. 6d. net.

The present work is divided into two main parts. The first part deals with the more important structural and physical properties of wood, and includes a general description of a tree, then separate descriptions of different parts such as pith, bark, primary wood, cambium, vessels, tracheids, wood fibres, wood parenchyma, rays, resin ducts, pits, tyloses, pith flecks, growth rings, heartwood and sapwood, the important particulars in each case being illustrated by figures of the parts magnified 200 250 diameters. Subjects such as grain and texture, knots, density and weight, water content, shrinkage, warping and checking, hygroscopicity, permeability, conductivity. resonance, colour, lustre, scent and taste are also discussed.

The second part is devoted to a key which includes all the important, and some of the unimportant, woods of the United States. By means of this key it is possible to place a wood fairly correctly in its genus and into a group of species, but, except in the case of species with very distinct characters, it does not remove the difficulty of the identification of species by means of wood characters alone. This is recognised by the author, for in his introductory remarks the words occur, "in the woods of many genera the structural variations apparently are not sufficiently distinct and constant to assure specific identification. Good examples of this are afforded by the woods of *Pinus*, *Quercus*, *Hicoria*, and *Populus*, where it is usually difficult and very often impossible to do more than separate them into groups. Accurate knowledge of the botanical and commercial range of each species will often serve as a basis for further sub-division of a group in which other distinctions are apparently wanting." This emphasises the necessity for definite information regarding the source of origin, together with common name and port of shipment of specimens of wood submitted for identification. It is also of great assistance in the identification of lesser-known woods when specimens of foliage, flowers and fruit accompany the specimens.

Following the key is a long bibliography referring to "Woods in General" and to the "Uses of the Woods of the United States and Canada," an appendix dealing more fully with various features referred to earlier in the work, a good index, and several plates showing wood structure.

The volume may be regarded as a very useful addition to the literature on the Identification of Woods, and it will be found valuable, not alone to students in the United States, but also to those in other countries.

W. D.

The Journal of Pomology.*—The cultivation of fruit was never so important an industry in this country as it is to-day, and, although probably at no period has it shown finer results, the cultivator has not in recent times been well supplied with up-to-date literature in his own special line, offered to him at any rate

* The Journal of Pomology. Edited by Edward A. Bunyard, F.L.S. Maidstone, George Bunyard & Co., Ltd. Published quarterly.

in compact form. In the horticultural press it is but one of many interests that jostle for recognition, and all the great standard works on the subject are so old that they fail to meet the needs of the student who would keep abreast with the times and who needs something more than the ordinary manuals at present available, admirable as some of them are.

Mr. Bunyard's new publication, therefore, comes most opportunely, and will be warmly welcomed. No one could possibly be better fitted for the editorial task than he. He has all the practical knowledge which comes to one born and bred in a great fruit nursery, he has a wide knowledge of ancient and modern pomological literature, both native and foreign, and, as we knew before this new journal appeared, himself possesses an enviable literary gift.

The *Journal* is of small quarto size, and the first number has sixty-four pages excellently printed and illustrated by one plate and several line engravings. The opening article is one by Miss Ida Sutton, dealing with self-sterility in plums, cherries and apples, a very important question; it is based on work carried out at the John Innes Horticultural Institution. There is an article on Seedless Raisin Grapes, and another by Dr. H. E. Durham on the problem of recognising fruits. Mr. E. A. Bunyard himself contributes a note on a congenial subject—an early eighteenth author and his book, Van Oosten and "The Dutch Gardener"—and another on the length of stem in pears and apples. Other items are reviews of current literature, News and Notes, a Report of the recent Pomological Conference at Metz, the whole constituting a most useful and interesting exposition of current pomological lore. W. J. B.

Science and Fruit Growing.*—A copy of this work has been presented to the Kew Library by the authors. It is a valuable summary of the experimental work done at the Woburn Fruit Farm since its foundation in 1894. From time to time Reports have been issued—sixteen in all, the first in 1897, the last in 1917—and there is still one to appear. Some of these are now out of print and, in any case, it is a great convenience to have the results of this long series of experiments condensed in one volume. The book is of more than ordinary interest because the conclusions arrived at by the authors have in several instances run counter to ancient and accepted maxims. This is notably the case in regard to transplanting and manuring. In late years much interest has been aroused by the Woburn experiments showing the influence of grass on trees and the action of one plant on another. Probably all the conclusions of the experimenters will not be universally accepted, but even if they are not, their publication has led cultivators to ponder more earnestly than ever before on the why and the wherefore of various methods of

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* Science and Fruit Growing. Being an account of the Results obtained at the Woburn Experimental Fruit Farm since its foundation in 1894. By the Duke of Bedford, K.G., F.R.S., and Spencer Pickering, M.A., F.R.S. London, Macmillan.

culture which had become simply matters of routine. Nothing but good can come from that. No section of the Woburn experiments has conferred greater benefit on garden practice than those dealing with insects and parasitic fungi, matters in which Mr. Pickering's knowledge of chemistry has been of the highest value. The book is copiously illustrated by reproductions of photographs, and is to be strongly recommended to all interested in fruit cultivation.

We understand from the preface that although it is no longer possible to continue the Farm on its original basis, the work will be carried on for the present on nearly the same lines and by the same managers as heretofore, but under the ægis of the Board of Agriculture and the Development Commissioners, the funds being provided by Government. W. J. B.

Wheat in East Africa.—Bulletin No. 4 of the Department of Agriculture, Nairobi, British East Africa, is a pamphlet of 16 pages, by Mr. W. J. Dowson, M.A., F.L.S., giving a concise summary of various reports and papers dealing with the cultivation of wheat in British East Africa.

Wheat was introduced into the Highlands of East Africa more than 20 years ago by missionaries, but after a few years the crops were almost invariably destroyed by the "Black Stem Rust" (*Puccinia graminis*). A wheat of Italian origin, known as "Rieti," was found to be a promising variety from the point of view of its resistance to rust, and was used as one of the parents in many hybridization experiments on Mendelian lines, which were commenced by Mr. G. W. Evans, and from 1913 continued by Mr. Dowson. Of more than 20 hybrids, only the following proved to be satisfactory—*i.e.*, really resistant to rust in a high degree, and at the same time fair croppers of good milling grain:—

1. Selections from Rieti crossed by Thew.
2. Selections from Early Rieti crossed by Thew.
3. Selections from Rieti crossed by Red Fife.
4. Selections from Egyptian No. 3 crossed by Nut Cut.
5. Selections from Egyptian No. 3 crossed by Thew.

Three wheat areas are designated as—(1) Nairobi, including Machakos, Nyeri and Thika, yielding 2 crops in the year; (2) Njoro, including Nakuru, where wheat is at present only grown in the long rains; and (3) the Uasin Gishu Plateau and the Trans-Nzoia, where most of the rain falls in one rainy season. The methods of cultivation vary according to the district. In the Nairobi area only small acreages of wheat are grown, and crops are obtained both during the long rains and during the short rains. In the Njoro district wheat is usually grown in large areas, even up to 1,000 acres. On the Uasin Gishu Plateau usually not more than 200 acres of wheat are planted in any one block, and only one crop of it is sown and reaped each year. The rotation generally followed in all three districts is either flax, wheat, beans,

or maize, wheat, beans. Wheat must never immediately follow beans, since these add too much nitrogen to the soil.

An interesting and useful table is given of the most important kinds of wheat grown in East Africa, with the districts in which the varieties are grown and remarks on their characters and economic value. A bushel of plateau wheat weighs between 60 and 65 lbs., and the average yield per acre is 20 bushels. A bushel of Njoro wheat weighs between 55 and 60 lbs. and the average yield is 15 bushels to the acre. Calculations are given showing that on 500 acres of wheat a net profit of from £1,250 to £3,250 is to be expected.

Three species of rust fungi attack wheat in East Africa, namely: *Puccinia graminis*, generally known as the "Black Stem Rust," *P. glumarum*, or the "Yellow Rust," and *P. triticina*, or the "Brown" or "Leaf Rust." Of these, *Puccinia graminis* is the worst and the most destructive, and all parts of the plants, but particularly the stems, are attacked. *P. glumarum* is not very common, and is most often found on wheat of Egyptian origin. *P. triticina* appears mostly on the leaves. The most practical method of combating the rust fungi is the breeding and selecting of resistant varieties. Thus by crossing Egyptian wheat, which is very susceptible to the attacks of *P. glumarum*, but highly resistant to *P. graminis*, with the Australian "Nut Cut," which is almost immune to the attacks of *P. glumarum*, but susceptible to *P. graminis*, a variety was obtained, some of whose progeny were highly resistant to both forms of rust. *Ustilago Tritici*, the loose-smut, is very generally distributed in East Africa, and *Cladosporum herbarum* is also respsonsible for some damage to ripe wheat.

The most serious insect pest of wheat in East Africa is the Wheat Aphis or Green Fly (*Toxoptera graminum*). Natural parasites, introduced from America, have served to keep it in check since 1912. Large animals, such as antelopes, hares, and even elephants, sometimes raid or cross wheat-fields, but the most destructive of all animals to wheat are pigeons and small birds.

W. B. T.

Brazil Wood.—In the paper on this subject (*K.B.* 1916, pp. 209-225) it was stated that herbarium specimens and a log of "Braziletto" (*Haematoxylon Brasiletto*, Karst.), had been promised to the Director from Colombia, with a view to determining the origin of "Peach Wood," "Lima Wood," "Nicaragua Wood" or "Wood of St. Martha," formerly an important article of trade about one hundred years ago. The flowering and fruiting specimens, collected by Mr. M. T. Dawe, F.L.S. (Nos. 480 and 575, Herb. Kew) reached Kew in March, 1917: but the log, although advised in September, 1916, as being ready at Santa Marta for shipment, did not arrive until November, 1919. The delay may best be accounted for in the following letter from the British Vice-Consul, Mr. Philip H. Marshal, at Santa Marta, dated October 10th, 1919: "About two years ago Mr. M. T. Dawe handed over to me for forwarding to you by first opportu-

nity a sample log of the dye-wood known as 'Braziletto,' and the restrictions imposed during the war and the later scarcity of ships between this port and Europe have made it impossible for me to carry out Mr. Dawe's recommendation until now. By s.s. 'Barranca' sailing for Bristol to-morrow I have consigned the log to Messrs. Elders and Fyffes, Ltd., with instructions to forward it to you upon arrival, and by first mail I shall advise Mr. Dawe in Bogota of this unavoidably tardy compliance with his request."

Mr. Boodle has examined the wood in the Jodrell Laboratory, and reports that "this has been compared with specimens in the Kew Museum of "Peach Wood" (Gourlie), "Lima Wood" (two specimens, Gourlie), and "Brazil Wood" (Mexico, Paris Exhibition, 1900).

"Braziletto," "Peach" and "Lima" Wood, as represented by these specimens, may well be the wood of the same species. The "Brazil Wood" (Mexico) is very similar.

The herbarium specimens place beyond all doubt that the species is *Haematoxylon Brasiletto*, Karst., and the results of Mr. Boodle's examination of the wood also prove that as suggested in the earlier paper (p. 217) the Museum specimens of "Peach" and "Lima" Woods referred to above are identical.

Although there is no specimen of wood under the name "Nicaragua" or "St. Martha" at Kew, it would seem to be quite safe also to include them under the same species and likewise the Mexican specimen of "Brazil Wood."

Mr. Dawe has also contributed to the Museum photographs showing "A Brazil Wood forest in Colombia," "Carting Brazil Wood to wharf at Santa Marta," and of "Brazil Wood awaiting export at Santa Marta." He reports "that the tree is found on the foot-hills around Santa Marta and appears to be fairly abundant. There is at present (letter to Director, dated Santa Marta, 30th September, 1916), lying here 300 tons for shipment to New York, interest having been aroused locally by the circulation of an exaggerated account of its value in New York. The exporters are now trying to find a market for this consignment in France or elsewhere."

It has been pointed out (l.c. p. 211) that there is now comparatively little or no demand for this wood or for any "Brazil Wood," and further in a recent report (Bull. Imp. Inst. xvi. 1918, p. 6), on a sample of "Braziletto" wood from the Bahamas (*Caesalpinia bahamensis*, Lam.), submitted to a firm of dye-stuff manufacturers, it is stated that "they had compared the Braziletto wood with commercial samples of "Brazil Wood" and "Peach Wood," and that in their opinion it could best be utilised as a substitute for "Peach Wood," although it gives rather browner shades. They added, however, that this wood was not of much interest at the present time."

J. H. H.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3] [1920

XI.—TROPICAL AGRICULTURAL COLLEGE IN THE WEST INDIES.

The proposal to establish a Tropical Agricultural College in the West Indies, which has been under consideration for some time, is dealt with fully in the following paper.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
24th February, 1920.

Sir,

I am directed to transmit to you printed copies of the Report of the Tropical Agricultural College Committee, and of the Secretary of State's despatch sending the Report to the Governments of the West Indian Colonies for consideration.

I am, Sir,
Your obedient servant,
G. GRINDLE.

DOWNING STREET,
27th January, 1920.

Sir,

In my despatch of the 11th September I informed you that I had appointed a Committee to consider whether it was advisable to found an Agricultural College in the West Indies, and, if in the Committee's opinion the answer to this question was in the affirmative, to make recommendations in regard to the situation, constitution, management, scope, finance, buildings, and any other matters which required to be considered in connection with the foundation of the proposed College.

2. It will be observed that I was fortunate enough to secure for the Committee the services of many of the most eminent men in the field of tropical agriculture, and of leading members of the West Indian commercial community in this country.

(873.) Wt. 135—47. 1,125. 4/20. J. T. & S., Ltd. G. 14. Sch. 12.

3. I now have the honour to transmit to you the Report of the Committee, who were unanimously of the opinion that steps should be taken at an early date to found a Tropical Agricultural College in the British West Indies.

4. The Committee refer to the Agricultural Colleges which have been established in Porto Rico, Hawaii, and Louisiana. They draw attention to the fact that the establishment of the proposed College is a matter of concern to the Empire at large, and of special interest to the other tropical Colonies and to the United Kingdom.

As regards the site of the College, the Committee recommend that Trinidad should be chosen if the Colonial Government is prepared to afford adequate support and other reasonable facilities. The Committee regarded Jamaica as in many respects the most suitable Colony for the purpose, but they came to the conclusion that considerations of inter-colonial transit would make it very difficult to place the College there.

The Committee make recommendations in some detail for the constitution of the College and contemplate that it should be administered by a governing body meeting in London, comprising representatives of the College itself, the contributing Colonies, the contributing industries, academic institutions in the United Kingdom, and the Secretary of State. They suggest a staff of ten professors and two lecturers, and a curriculum comprising junior and senior courses of instruction, an advanced course, and arrangements for post-graduate studies of special subjects. They strongly recommend that a Sugar School should be provided and equipped with a complete plant on a small but working scale. They also suggest that, if the College were established in Trinidad, a branch for Oil Technology should be added.

As regards finance, the Committee propose that a fund of £50,000 and upwards should be raised by private subscriptions for the establishment of the College and that its maintenance should be provided for by contributions from the West Indian Colonies on a suggested basis of $\frac{1}{2}$ per cent. of their revenues, and by the Imperial Government on the basis of a grant of £1 for every £1 contributed by the Colonies, with a maximum of £15,000 a year, apart from fees and voluntary contributions.

The Committee regard it as essential that the Imperial Department of Agriculture should be closely associated with the College.

5. In my opinion the scheme propounded by the Committee is worthy of the most careful attention of the people of the West Indies. They have already had considerable experience of the economic value of agricultural science. Among the most striking examples are the improvements which have been effected both in the amount of sugar contained in canes and in the proportion which it has been possible to extract, and the history of the Sea Island cotton industry and of the measures devised to combat its pests. Much more may be expected from the establishment of an institution which will receive students from every West Indian Colony and provide a steady stream of men equipped with the most recent knowledge in the science of tropical agriculture and technology. It must not, of course, be supposed that college

training, even of the most practical kind, can supply the place of actual experience on plantations and in factories; but it can make men far better fitted to profit by that experience. Such men will bring a wide outlook to their work in field or factory, will be constantly on the watch for improvements in current practice, and, when they have gained experience, will be qualified to cope with insect pests and fungous diseases and to introduce new methods and staples without imprudence when the occasion requires it.

The proposed College offers advantages, direct or indirect, to every section of the community: to the students themselves by increasing their mental resources and economic value: to the planters, by providing them with qualified assistance: to the peasant proprietors, by placing skilled advice within easier reach and by improving the market for their produce: to factory owners, by supplying the chemical and other knowledge which is now so difficult to obtain: to the labourers, by rendering it possible for them to receive higher wages: to the general community, by the increase of trade and wealth and, not least, by supplying a means likely to mitigate the severity of those periods of economic depression which will, I fear, long remain inevitable in the future as in the past. Moreover, it is likely to attract students, some of them men of experience, from all the tropical parts of the Empire: and the West Indies, in common with the British communities of Africa, Asia, and the Pacific, will no doubt benefit from the relations which will be formed and the ideas which will be exchanged.

6. Accordingly it seems to me that the people of the West Indies have now an opportunity, which might well mark an epoch in their economic history, of founding an institution which would at present be unique in the Colonies, and that, in their existing relative prosperity, their resources are such that they may well hope that it may equal or even surpass in scope and usefulness any similar institution on foreign soil.

7. It may be of interest if I somewhat amplify the reference which the Committee make to such foreign institutions, and add a few remarks upon similar institutions in the Indian Empire. This will afford material for some discussion of the scope of the proposed College.

The Island of Porto Rico already possesses a "College of Agriculture and Mechanic Arts" associated with the University of Porto Rico. This College, situated at Mayaguez, was opened in 1912 in a building furnished at a cost of thirty thousand dollars by the Government of the Island, working under the Morrill and Nelson Fund provided by the Government of the United States. This Fund, amounting to fifty thousand dollars, is the same as that furnished to similar Colleges in the United States. Within a year of its foundation, the College had in attendance over one hundred students from all parts of the Island of Porto Rico, and its direct grant from the insular Government, over and above the sum supplied by the United States Government, was sixty-one thousand dollars for the financial year 1913-14. In addition to the primary work of teaching the principles and practice of

agriculture to the students actually enrolled, the Mayaguez institution has from the outset undertaken the important task of aiding the ordinary teachers of Porto Rico in their effort to relate school training to the daily avocations of the people. It is not clear to me how far the Porto Rico College can or does devote itself to work other than the teaching of agriculture to its students and the training of ordinary school teachers in the subject. I am aware that the College was located at Mayaguez so as to be near the Agricultural Experimental Station which was established there seventy years before the College; but if there are published papers indicating activity on the part of that College in the investigation of unsolved problems they have not been brought to my notice.

The Sugar School in Louisiana is, however, known to undertake the tasks both of imparting and of advancing knowledge. The proposed College in the British West Indies should be able to do for their people all, and more than all, that the Louisiana Institution does for the people of the United States. The College would certainly be intended to give due attention to every one of the agricultural industries and interests of the Colonies, not only as regards instruction but also as regards investigation. In this respect it should come to deserve comparison with the singularly well equipped Tropical Research Institute created by the Netherlands Government at Buitenzorg in Java, and with the similar Institute at Pusa in Behar on behalf of the Indian Empire.

At Pusa one of the most important duties to be fulfilled is that of the education, during a prescribed period and with regard to Indian conditions, of the recruits engaged for service in the agricultural departments of the various Indian Governments who have received their agricultural training at Universities and Technical Colleges in the United Kingdom. At Pusa, too, are trained for such service those natives of India who are selected with a view to filling agricultural posts under the Government of India itself. It may be assumed that the new College will do for the West Indian Colonies what Pusa does for the whole of India.

In this matter India is not differently circumstanced from the rest of the Empire. At present the men who are selected to fill the various scientific agricultural posts in the tropics of south-eastern Asia and Africa, just like those selected for service in India, have received their agricultural training in chemistry, botany, plant pathology, or general agriculture in the Universities or Colleges of Great Britain, Canada, the Union of South Africa, Australia or New Zealand. Sound and extensive though this training undoubtedly is, the fact remains that it does not really amount to a complete introduction to the specialised problems which confront the agricultural officer in tropical countries. The training imparted in a temperate climate affords the necessary groundwork on which to build up tropical experience. But much time and labour are required before the newcomer can, unaided, adapt himself to conditions that are strange and peculiar, and is in a position to make use of his gradually acquired experience for the good of the community whose Government he

serves. India has discovered this elementary truth and has taken steps to overcome the difficulty. Other tropical dependencies and Colonies have realised it too, but have been hitherto unable to apply the only rational remedy.

Besides the institution at Pusa, it has been found desirable to establish no fewer than seven agricultural Colleges in the various Provinces of India. These are for the most part occupied in the training of the sons of Indian landed proprietors.

8. As regards the site of the College, I agree with the Committee that the most suitable Colonies are Jamaica and Trinidad, and I think that in the present condition of steamship communications the balance of advantage lies with the latter. But it is not impossible that, before it becomes necessary to decide this question finally, a link may have been provided in the form of a steamship connection between Jamaica and the Lesser Antilles.

9. While I am in cordial agreement with the substance of the report, I do not feel able at present to accept it in all its details. I am doubtful about the suggestion that a branch of the College might be established for Oil Technology, but this is evidently a collateral question which forms no essential part of the scheme. I feel more serious difficulty about the proposal that the Imperial Government should be asked for financial assistance. I readily admit that the proposed College is of great importance to the United Kingdom and to the Empire at large. But there are many educational institutions in the United Kingdom which are similarly of importance to the Colonies although it is only in a very few cases that the latter make any contribution. The considerable measure of prosperity which many of the West Indian Colonies are now enjoying further weakens the case for Imperial assistance. I shall defer further consideration of this point until I have the views of the Colonies, but if Imperial assistance is not forthcoming it will evidently be necessary to raise the suggested rate of Colonial contribution.

I note that the report does not refer to the provision of courses of instruction suitable for teachers in elementary schools, but I should hope that the proposed College would find it possible to undertake this work.

10. I request that you will give the widest publicity to this despatch, and will communicate copies to the Legislature and to the agricultural and commercial institutions in the Colony, and that, when you are thoroughly informed of local public opinion on the various points raised, you will furnish me with a full report in the matter.

I have, etc.

(for the Secretary of State),

L. S. Amery.

REPORT OF THE TROPICAL AGRICULTURAL COLLEGE COMMITTEE.

To the Right Honourable Viscount Milner, G.C.B., G.C.M.G., Secretary of State for the Colonies.

My Lord,

The Committee appointed by your Lordship on August 25th, 1919, to consider the desirability of establishing a Tropical Agricultural College in the British West Indies, and matters connected therewith, beg leave to submit their Report as follows.

2. The Committee comprises the following members:—

Dr. A. E. Shipley, LL.D., Sc.D., F.R.S., *Chairman*, Master of Christ's College, Cambridge, and Deputy Vice-Chancellor.

Lieut.-Colonel Sir David Prain, C.M.G., C.I.E., F.R.S., *Deputy-Chairman*, Director of the Royal Botanic Gardens, Kew.

Sir Norman Lamont, Bart., Member of the Legislative Council of Trinidad and Tobago.

The Hon. Gideon Murray, M.P., late Administrator of St. Lucia.

Sir Owen Philipps, G.C.M.G., M.P.

Sir Henry Frank Heath, K.C.B., Secretary to the Department of Scientific and Industrial Research.

Sir Francis Watts, K.C.M.G., D.Sc., Imperial Commissioner of Agriculture for the West Indies.

Sir Edward Davson, President of the Associated Chambers of Commerce of the West Indies.

Dr. C. A. Barber, C.I.E., Sc.D., F.L.S., Sugar-Cane Expert for India.

Mr. Robert Rutherford, Chairman of the West India Committee.

Mr. Henry Alexander Trotter, Deputy-Chairman of the West India Committee.

Mr. Eliot Arthur de Pass, Chairman of the Jamaica Standing Committee of the West India Committee.

Dr. J. B. Farmer, M.A., D.Sc., F.R.S., Professor of Botany, Imperial College of Science and Technology.

Captain A. W. Hill, M.A., Sc.D., F.L.S., Assistant Director of the Royal Botanic Gardens, Kew.

Mr. W. H. Himbury, General Manager of the British Cotton Growing Association.

Mr. J. W. McConnel, Member of the Empire Cotton Growing Committee, Board of Trade.

Mr. G. Moody Stuart, West Indian Estates, Proprietor.

Mr. Algernon E. Aspinall, C.M.G., B.A., *Hon. Secretary*, Secretary of the West India Committee.

Sir Henry Frank Heath, K.C.B., was unable to attend any of the meetings, and was represented by Mr. A. Abbott. Dr. C. A. Barber, C.I.E., Sc.D., F.L.S., was co-opted a member of the Committee.

3. At the first meeting of the Committee, held on September 16th, Dr. A. E. Shipley, LL.D., Sc.D., F.R.S., and Lieut.-Colonel Sir David Prain, C.M.G., C.I.E., F.R.S., were appointed Chairman and Deputy-Chairman respectively, and Mr. Algernon E. Aspinall, C.M.G., B.A., Honorary Secretary.

4. The terms of reference to the Committee are set out in your Lordship's letter of August 25th, 1919, to the members of the Committee as follows:—

"To consider whether it is advisable to found an Agricultural College in the West Indies, and, if in the Committee's opinion the answer to this question is in the affirmative, to make recommendations in regard to the situation, constitution, management, scope, finance, staff, buildings, and any other matters which in the opinion of the Committee require to be considered in connection with the foundation of the proposed College."

5. *Desirability of Establishing a College.*—The Committee desire to state at the outset that they are unanimously of the opinion that steps should be taken at an early date to found a Tropical Agricultural College in the British West Indies.

6. The need for such an institution has for some years been increasingly apparent. In order that our Colonies and Possessions may be placed in a position to compete successfully with foreign countries in the production and marketing of the staples of the tropics, it is of paramount importance that their young men should be afforded opportunities for instruction in the principles of agriculture, and in the cultivation and preparation for market of tropical produce of every kind, including especially sugar and its by-products rum and molasses, cacao, coffee, cotton, coconuts, rice, citrus and other fruits—notably bananas, and dye-woods, many of which commodities constitute the raw materials employed in the manufactures of the Mother Country.

7. Equally important is the need which exists of making full provision for the prosecution of research, and for the training of scientific investigators in matters pertaining to tropical agriculture amid suitable surroundings, and for creating a body of British expert agriculturists well versed in the knowledge of the cultivation of land in the tropics, and of scientific advisers possessing an intimate knowledge of the means of combating pests and diseases the control of which is fundamentally essential to the successful development of agriculture in the tropics.

8. It has been brought before the notice of the Committee that Agricultural Colleges have been established successfully in Porto Rico and Hawaii, besides a University in Louisiana, which possesses, moreover, an unrivalled Sugar School at Audubon Park, New Orleans, and they would regard it as a reproach if Great Britain were to remain behind the United States in this matter. The Committee desire especially to emphasize the fact that the establishment of a Tropical Agricultural College in the West Indies is a matter of Imperial concern. Such a college would be of no less importance to the Mother Country than to the Colonies immediately concerned, having regard to the present necessity of developing production throughout the Empire to the utmost extent, and to the opportunities which it would afford to students

trained in agriculture at Universities in the United Kingdom to continue their training as post-graduates in the tropics.

9. *Situation of the College.*—Sir Leslie Probyn, K.C.M.G., Governor of Jamaica; Major Sir John Chancellor, K.C.M.G., D.S.O., Governor of Trinidad and Tobago; Mr. T. A. V. Best, C.M.G., C.B.E., Colonial Secretary of Trinidad and Tobago, and Mr. P. C. Cork, C.M.G., late Colonial Secretary of Jamaica, attended before the Committee and submitted evidence regarding the claims of their respective colonies to selection as the head-quarters of the proposed College. The Committee also had the advantage of perusing a valuable memorandum submitted by Sir Sydney Olivier, K.C.M.G., C.B., late Governor of Jamaica, who, as Secretary of the Royal Commission in 1897, visited all the West Indian islands and British Guiana, and thus has an intimate knowledge of their conditions and requirements.

10. After carefully considering the matter in all its aspects, and with special reference to the geographical position and grouping of the various West Indian islands and British Guiana, and to the general desire that the college should be closely associated with the Imperial Department of Agriculture, the Committee recommend that the Tropical Agricultural College be established in Trinidad, provided that the Government of Trinidad and Tobago is prepared to afford it adequate support and every reasonable facility.

11. In arriving at this decision the Committee were influenced by the fact that Trinidad possesses a wide variety of industries and is easy of access by steamer communication to residents in the neighbouring islands and British Guiana.

12. The Committee recognise that the claims of Jamaica have great weight, this Colony having a population approximating to that of the rest of the West Indian islands, and a still wider variety of industries than that possessed by Trinidad. They feel, however, that difficulties of intercolonial transit would form a serious obstacle to the transfer of the Imperial Department of Agriculture to Jamaica if, as is so much to be desired, the islands of the Lesser Antilles are still to derive immediate advantage from the work of that useful body.

13. Mr. E. A. de Pass strongly urged the claims of Jamaica: but the Committee reluctantly feel that, owing to its geographical position, Jamaica must to some extent be treated as a separate unit in this matter. In view, however, of the great importance of that island's agricultural interests there should, in their opinion, be intimate co-operation between the Jamaica Agricultural Department and the Imperial Department of Agriculture, and the Committee believe that it would be of advantage to Jamaica to identify itself with the proposed Tropical Agricultural College. The Commitee further suggest that the usefulness of the organisation at present existing in Jamaica for agricultural training and research might be extended by a modification in the case of that Island of the financial proposals contained in a later paragraph of this Report, so that Jamaica's contribution and the proportion of any Imperial grant added thereto might be divided between the funds of the proposed College and a local Agricultural School.

The claims of Barbados were also closely considered, but could not be entertained owing to the smaller range of that Island's products.

14. *Incorporation.*—It being obviously desirable that the Tropical Agricultural College should, from its inception, be established as a legal entity, the Committee have had under consideration the various means by which this could be effected.

15. They are strongly of opinion that it would add materially to the standing and influence of the College if it were to be incorporated by Royal Charter. They are advised, however, that it will be better to defer petitioning the King for the grant of a Royal Charter until the College has been successfully established with every prospect of permanency.

16. Whilst, therefore, advocating that it should be the ultimate object of the Governing Body of the Tropical Agricultural College to petition His Majesty for the grant of a Royal Charter of Incorporation, the Committee recommend that, at the outset, the College be incorporated in the United Kingdom as a Company limited by guarantee, and that application be made to the Board of Trade for a licence, under Section 20 of the Companies (Consolidation) Act of 1908, whereby the word "Limited" may be omitted from its name.

17. They append to this report documents marked A and B* showing what procedure should be adopted in this connection. In recommending the Incorporation of the College in the United Kingdom, the Committee have not lost sight of the question of possible liability to Income Tax, etc. They are advised, however, that in view of the fact that the objects of the College would be a charitable purpose within the meaning of those words as used in the Income Tax Acts, it would be entitled to exemption from taxation in respect of income derived from any investments representing an endowment fund, and that monies received for expenditure on general purposes would be similarly exempt from Income Tax.

18. *Constitution.*—With regard to the Constitution of the proposed College, the Committee desire to make the following recommendations:—

(1) They regard it as highly desirable that an intimate relationship should be established between the Imperial Department of Agriculture and the Tropical Agricultural College.

After careful consideration, the Committee recommend that in the first instance the Imperial Commissioner of Agriculture be the Principal of the College, and that, when occasion arises for a new appointment, the Trustees and Governors (to be constituted as hereinafter provided for) nominate a Principal and, in consultation with the Secretary of State for the Colonies, arrange that such Principal also holds the position of Imperial Commissioner of Agriculture should the Secretary of State desire to appoint him to that office.

(2) The Trustees and Governors of the College should be a body composed of (*a*) ex-officio, (*b*) nominated, and (*c*) co-opted mem-

* These documents have been omitted in this reprint.

bers, and should constitute a Governing Body whose meetings should ordinarily be held in London.

The Governing Body should administer the affairs of the Tropical Agricultural College, should hold and expend all monies belonging to the College, and should appoint and/or dismiss all officers of the College. They should appoint from their own body a Finance Committee whose meetings should ordinarily be held in London, and should also appoint from their own body an Executive Committee whose meetings should be held in the Colony in which the Agricultural College is situated.

The ex-officio members of the Governing Body should be two in number, namely:

(*a*) The senior Financial Officer for the time being of the Colony in which the College is situated.

(*b*) The Principal of the Tropical Agricultural College.

The nominated members of the Governing Body might vary in number, and should include:—

(*a*) Two members appointed by the Secretary of State for the Colonies, of whom one might ordinarily be able to serve as a member of the Finance Committee and the other as a member of the Executive Committee (to be constituted as hereinafter provided for).

(*b*) One member appointed by the Academic Board of the Tropical Agricultural College who should ordinarily serve also on the Executive Committee.

(*c*) A group of members nominated by the contributing Colonies. The number of such Trustees and Governors might vary, but the Committee anticipate that the number might be six, viz., one each nominated from Barbados, British Guiana, Jamaica, Trinidad and Tobago, the Leeward Islands, and the Windward Islands.

(*d*) A group of members nominated by contributing industries. In this case, again, the number of such Trustees and Governors might vary, but the Committee consider it possible that the number might be five, viz., one each representing the cacao, cotton, coconut, fruit-growing, and sugar industries, respectively.

(*e*) Three members nominated by and representing Academic Institutions in the United Kingdom. The Committee regard such representation as a matter of the highest consequence, and suggest that, for purposes of nomination, those institutions deemed suitable by the Governing Body be placed on a roster and invited to nominate representatives in such order as they may determine. The Committee further recommend that the three Academic Institutions first invited to nominate each one Trustee and Governor be the University of Cambridge, the University of Glasgow, and the Imperial College of Science and Technology of London.

The co-opted members of the Governing Body should be four in number, of whom two should ordinarily be invited in respect of their ability to serve also as members of the Finance Committee, and the other two in respect of their ability to serve also as members of the Executive Committee.

The Finance Committee should be composed of such Trustees and Governors as the Governing Body determine, and the duties

of the Finance Committee should be defined from time to time by the Governing Body.

The Executive Committee should include the two ex-officio Trustees and Governors of the College, and such other Trustees and Governors as the Governing Body determine, provided always that any member of the Governing Body should be at liberty to attend any meeting of the Executive Committee, and in the event of his being present should be entitled to vote. The duties of the Executive Committee should be defined from time to time by the Governing Body.

The two ex-officio Trustees and Governors should remain members both of the Governing Body and of the Executive Committee so long as they continue to hold the offices in virtue of which they respectively serve.

The four co-opted Trustees and Governors should continue in office for a period of four years only; but it should, nevertheless, be competent for the Governing Body to re-appoint a co-opted member at the expiration of his period of service.

The several nominated Trustees and Governors should continue in office for a period of four years only, subject to the proviso that the odd numbers of those first nominated as Trustees and Governors should be appointed to serve for six years. Except in the case of Academic Institutions in the Untied Kingdom invited by the Governing Body to nominate representatives, it should be competent for each nominating authority to re-appoint a nominated member at the expiration of his period of service. In the case of Academic Institutions permission to this effect might be granted by the Governing Body.

The normal composition of the Governing Body as suggested may be summarised as follows:—

A. Ex-officio members (also ex-officio members of the Executive Committee)	2
B. Nominated members:—	
Representing the Secretary of State for the Colonies	2
Representing the Academic Board of the Tropical Agricultural College	1
Representing the Contributing Colonies, possibly	6
Representing the Contributing Industries, possibly	5
Representing Academic Institutions in the United Kingdom	3
C. Co-opted Members	4
Total	23

(3) The Academic Board should be composed of the Principal and the Professors of the Tropical Agricultural College, and should have charge of the Students of the College, and be responsible to the Governing Body for the discipline of the Students and for the details of the instruction imparted to them.

(4) The Staff of the College should consist of the Principal, and of such Professors (ex-officio members of the Academic

Board), and Lecturers (who should not be members of the Academic Board), together with other assistants, as the Governing Body from time to time appoint to serve. The Staff should, from the inception of the College, include teachers with the status of Professors in the following subjects:—

1. General Agriculture;
2. Mycology;
3. Entomology;
4. Agricultural Chemistry;
5. Organic Chemistry;
6. Agricultural Bacteriology;
7. Agricultural and Physiological Botany;
8. Genetics;
9. Sugar Technology; and
10. Agricultural Engineering and Physics:

and teachers with the status of Lecturers in the two subjects:—

11. Stock and Veterinary Science; and
12. Book-keeping.

19. In connection with the Staff, the Committee beg to recommend strongly that one of the duties delegated at the outset by the Governing Body to their Finance Committee be that of devising a suitable scheme of pensions for the members of the College Staff; and that one of the duties delegated to their Executive Committee be that of arranging that provision be made for the granting to members of the Staff of periods of Study-leave in addition to any furlough to which, as teachers in the College, they may be entitled.

20. *Curriculum*.—Though they have recommended (*see* Section 18 (3) above) that the details regarding the instruction to be given to Students of the Tropical Agricultural College should be settled by the Academic Board which it is proposed to set up, the Committee submit the following suggestions as to a curriculum, put forward by Sir Francis Watts, K.C.M.G., D.Sc., with the general principles of which they are in agreement:—

"(*a*) A junior course of instruction in tropical agriculture extending over two, or possibly three, years. This course should be arranged to meet the requirements of youths leaving the Secondary Schools of the colonies who intend to follow ordinary agricultural pursuits, probably in the colonies from which they come. There should be some educational standard of requirement for admission to the course. This might be an examination of the College, or certain recognised examinations might be accepted in substitution, such, for example, as the Senior Local Examination of Oxford or Cambridge, or other similar examinations. This course of instruction should embrace general agricultural science and agronomy, together with such practical instruction in the elements of field agriculture as the equipment of the College permits.

"(*b*) A senior course of similar instruction extending over not less than four years.

"(*c*) A course of two years' instruction in more advanced tropical agriculture for students who have undergone a course of instruction in general agriculture in a recognized institution, such as a University, a University College, or an Agricultural College. This course would practically coincide with the final two years' teaching of the last-named course (*b*).

"(*d*) Post-graduate study of special agricultural subjects in their tropical application, as, for example, Entomology, Mycology, Chemistry, Plant Breeding, and the general study of special crops such as sugar, cacao, cotton, coconuts, rice, and a variety of others, to be arranged to meet the requirements of individual students. These studies would be carried on through the College, in association with the Imperial Department of Agriculture, and, by arrangement with the respective Governments, through the medium of such Local Agricultural Departments and Experiment Stations as appear to be particularly suited for the work. It is probable that facilities in connection with these studies may be offered by the owners of sugar and other factories and by the owners of plantations, and that courses of instruction to meet the needs of individual students may be arranged by the Academic Board to meet special cases."

21. *Sugar School.*—Recognizing the urgent need which exists for the provision of scientific and technical training in sugar manufacture, the Committee strongly recommend that a Sugar School equipped with a complete plant on a small, but working, scale be established in connection with the Tropical Agricultural College. They believe that the leading sugar machinery manufacturing firms would be willing to contribute different portions of this plant.

22. *Oil Technology.*—In view of the growing importance of the oil industry of Trinidad, it has been suggested to the Committee that, in the event of it being decided to establish the Tropical Agricultural College in Trinidad, a technical branch might be added to that institution, where men could obtain practical training in oil technology and the control of oilfields. Students would have exceptional opportunities of acquiring knowledge, inasmuch as they would be able to visit the oilfields periodically, while the presence in the island of many fully qualified engineers, geologists, drillers, etc., would permit of lectures being given from time to time on all subjects associated with petroleum.

23. *Financial Arrangements.*—In approaching the question of way and means, the Committee have had constantly in view the fact that though the Tropical Agricultural College would be located in the West Indies it would be, to a great extent, Imperial in its scope and activities, it being expected, for example, that the senior students would be post-graduates of British Universities and Colleges and that many of the students trained in the College would be available for service throughout the Empire. Apart from this, they would point out that, as stated in an earlier

paragraph of their report (Section 8), it would be manifestly to the benefit of the Mother Country that production should be extended in the British West Indies on scientific and remunerative lines. They would emphasize, moreover, in this connection, that, of the American Agricultural Colleges to which reference has already been made, that of Porto Rico, at any rate, is subsidised by the United States Government. In order to provide the requisite ways and means for the establishment and maintenance of the West Indian Tropical Agricultural College, the Committee recommend that:—

(1) For the establishment of the College a Fund of £50,000 and upwards should be raised by private subscription.

(2) For the maintenance of the College—

(*a*) Annual contributions should be invited from the various West Indian Colonies on the basis of the equivalent of, say, ½ per cent. of their average revenue during the preceding three years, and each Colony, in return for its contribution, should have the right to nominate a representative to sit on the Governing Body of the College and to enjoy special privileges in respect of its students; it being understood in this connection that the constituent Islands of the Windward Islands group should be regarded as one Colony.

(*b*) Annual contributions should be invited from the Imperial Government as grants-in-aid, on the basis of £1 for every £1 contributed by the Colonies, the liability of the Imperial Government, however, not to exceed £15,000 in one year.

(*c*) Voluntary contributions should be invited from industrial organisations and individuals interested in tropical industries.

The Committee feel very strongly that the claim for Imperial assistance would be fully justified by reason of the Imperial nature of the work to be undertaken.

They also feel that, if their recommendations meet with your Lordship's approval, it would greatly facilitate the collection of contributions from those interested in tropical industries if your Lordship would yourself issue the appeal.

24. *College Buildings.*—The Committee consider that the question of College Buildings is one which should be remitted to the Governing Body when duly constituted. They would, however, express the hope that the Government of whichever West Indian colony may be selected as the site of the Tropical Agricultural College will meet the Trustees and Governing Body in a liberal spirit in this connection, and they desire to record that they have already received a generous offer of accommodation on a substantial scale from the Governor of Jamaica. It need hardly be added that the Committee attach the greatest importance to the buildings being erected in healthy surroundings and on thoroughly hygienic lines.

25. *Imperial Department of Agriculture.*—Having regard to their recommendation that the Tropical Agricultural College

should be closely associated with the Imperial Department of Agriculture, the Committee consider it as within their terms of reference to emphasize, as they desire most earnestly to do, the importance of establishing that Department on a more permanent basis after the expiration of the present Imperial grant.

26. The Committee wish in conclusion to express their obligation to Mr. Algernon E. Aspinall, C.M.G., B.A., for his services as their Honorary Secretary, and for the great assistance which he has given them in their work.

We have the honour to be, My Lord,

Your Lordship's obedient servants,

A. E. Shipley (Chairman).
D. Prain.
Norman Lamont.
Ermine Murray (for Gideon Murray).
Owen Philipps.
Francis Watts.
Edward Davson.
A. Abbott (for Sir H. Frank Heath).
C. A. Barber.
R. Rutherford.
H. A. Trotter.
E. A. de Pass.
J. Bretland Farmer.
Arthur W. Hill.
W. H. Himbury.
John W. McConnel.
Geo. Moody Stuart.

Algernon E. Aspinall,
Hon. Secretary,
22nd October, 1919.

After this report had been approved the Committee held a further meeting to consider the following cablegram received on November 5th, by Mr. E. A. de Pass, from Mr. A. W. Farquharson, Chairman of the Jamaica Imperial Association:—

> "Financial majority Elected Members agree support initial grant £50,000 and £5,000 annually towards the Agricultural College if Jamaica made headquarters Imperial Department of Agriculture.—Farquharson."

The Committee, whilst adhering to the recommendations contained in their report, suggest that, in the event of Trinidad and the Windward and Leeward Islands not seeing their way to support adequately the proposed Tropical Agricultural College—a contingency which the Committee hope may not arise—the possibility of establishing the College in Jamaica may again be considered. The question as to the site of the Imperial Department of Agriculture does not come within the terms of reference to

the Committee, although they have found it necessary in the course of their report to refer to this important aspect of the question.

ALGERNON E. ASPINALL,
Hon. Secretary.

25th November, 1919.

XII.—THELLUNGIA, A NEW GENUS OF GRAMINEAE.

O. STAPF.

About a year ago Dr. Thellung, of Zürich, submitted to Kew a grass which had sprung up among the wool refuse of the worsted mill, Derendingen, near Solothurn (Switzerland). It was first observed in 1907, in some young specimens which flowered only imperfectly. One of these was submitted to Professor Hackel, who very hesitatingly suggested that it might be a species of *Ectrosia*. As such ("*Ectrosia? mutica*, Hackel ad int.") it was enumerated by Probst in his paper "Die Adventiv- und Ruderalflora von Solothurn und Umgebung" in Mitteil. naturforsch. Ges. Solothurn, 5. xvii. Ber. 1911 1914, p. 164 (1914), but without a description being given. An attempt made then by Drs. Thellung and Probst to grow it in a pot failed, and it was not until 1918 that good flowering specimens presented themselves in the same locality where the plant had been found originally. The preceding summer (1917) having been very hot it is not improbable that the grass was thereby stimulated to more active growth and ample flowering.

The rich alien flora around the Derendingen mill includes numerous grasses of Australian origin. An analysis of the grass soon showed that it could not be an *Ectrosia*, nor did a prolonged search among the Australian grasses lead to its identification. Argentina and South Africa were suggested as likely native countries, but with no better result. Fortunately the condition of the specimen was good enough to allow of a very complete examination of the floral structure, which was found to be very like that of a *Sporobolus*, but distinguished by the presence of several (mostly three and sometimes four) florets in each spikelet. Moreover the disposition of the spikelets in the inflorescence proved to be different. The very close relationship of *Sporobolus* and *Eragrostis* demanded comparison with the latter, and some of its closer allies as *Leptochloa* and *Diplachne*; but the strictly 1-nerved delicate valves coupled with the free pericarp of the grain excluded those genera and led again back to *Sporobolus*. Now *Sporobolus*, as we understand it at present, is a well defined and uniform genus which although rich in species has practically no synonymy that would throw doubt on its homogeneity. One of its salient characters is the presence of only one floret in each spikelet and the discontinuation of the rhachilla above it. As to the latter, we know at present only of one clear exception, viz. *S. subtilis*, a Madagascar species, and as to the increase in

the number of florets the cases quoted in Bentham and Hooker's Genera Plantarum (*S. compressus* and *S. serotina*) and in Martius's Flora Brasiliensis (*S. ramosissima*) concern only individual spikelets in otherwise normal inflorescences and seem to be altogether rare. I myself have seen 2-flowered spikelets only in a specimen of *S. compressus* which was attacked by some fungal disease. Instances of a similar exceptional addition of florets occur in *Panicum*, *Andropogon* and *Oryza*, genera with an otherwise perfectly stereotyped number of florets, and they have never been considered to affect the character of those genera. However close the spikelets of the Derendingen grass may approach those of *Sporobolus* in the structure of the parts, they contrast so decidedly in the number of florets that to include the grass in *Sporobolus* would vitiate our well established conception of that genus. This contrast is moreover enhanced by the grouping of the spikelets in pairs on the somewhat distant spike-like and themselves spicate branches of the inflorescence, a disposition not known in *Sporobolus*. Thus the Derendingen grass appears to represent a type concording in many ways with *Sporobolus*, yet clearly and discontinuously detached from it in other respects, and this condition will be best expressed by conceding generic rank to the new type and placing it next to *Sporobolus*. The fact that it grew among a considerable number of aliens of Australian origin renders it highly probable that this grass too came from the same source. The following is a technical description of the new genus and of its only species. The genus has been named *Thellungia* in acknowledgment of the excellent work Dr. Thellung has done in connection with the adventitious flora of Europe.

Thellungia, *Stapf* [Gramineae-Sporoboleae] gen. nov.: affine *Sporobolo*, sed spiculis 3—4-floris bene distinctum.

Spiculae lateraliter compressae, per paria in ramis brevibus paniculae fere spicam compositam referentis subsessiles, imbricatae, continuae cum pedicellis; rhachilla tarde disarticulata supra glumas et inter anthoecia, glabra, paululo ultra basin anthoecii summi producta. *Anthoecia* 3–4, omnia ♀. *Glumae* 2, delicate membranaceae, subaequales, 1-nerves, tenuiter carinatae. *Valvae* glumis simillimae, nisi superiores breviores. *Valvulae* quam valvae conspicue breviores, tenuiter 2-carinatae, inter carinas subplicatae. *Lodiculae* 2, late cuneatae, carnosae. *Stamina* 3. *Ovarium* glabrum; styli perbreves, terminales; stigmata plumosa, brevia. *Caryopsis* libera, nuda cadens ut videtur; pericarpium tenue, siccum semini adpressum, humefactum expansum, semen more utriculi circumdans. *Semen* a latere compressum, sectione transversa cuneatum; hilum punctiforme, basale. *Embryo* ad medium semen attingens.—Gramen gracile, perenne; foliorum laminae angustae, vernatione convolutae; ligulae ad marginem ciliolatum redactae. Inflorescentia angustissima; rami solitaria, e basi floriferi, axi communi subadpressi et eius internodiis paulo longiores vel superiores breviores et magis appressi. Spiculae nitentes, mediocres.

Species unica, verosimiliter Australiensis.

2552c382

T. advena, *Stapf.* *Gramen* glaberrimum, inflorescentia inclusa ultra 5 dm. altum; innovationes intravaginales, basi paululo bulboso-incrassatae et pallidae, 5-6-foliatae. *Caules* tenues teretes, circa 4-nodi, nodis exsertis. *Foliorum* vaginae teretes, arctae, tenuissime striatae; laminae anguste lineares, longe apicem versus attenuatae, acutae, ad margines superne scaberulae, caeterum laeves, pallide virides, ad 12 cm. longae, ad 2·5 mm. latae, summa basin inflorescentiae longe excedens, costa nervisque lateralibus approximatis tenuibus. *Inflorescentia* fere epedunculata, basi in vagina summa inclusa, tota ad 25 cm. longa; rami infra medium siti circiter 1·7 -1·4 cm. longae, superiores sensim breviores. *Spiculae* plerumque 4 mm. longae. pallide virescentes, hincinde leviter purpureo-suffusae, imperfecte apertae; una uniuscuiusque paris brevissime, altera longius pedicelatae vel utraque subsessilis; rhachilla flexuosa. *Glumae* hyalinae, albidae, perangustatae, lineari-lanceolatae vel lineares. inferior acute acuminata, superior obtiuscula, utraque superne in carina viridi asperula. *Valvae* glumas paulo excedentes. glumae inferiori simillimae, nisi inferne paululo latiores et minus acutae, sursum descrescentes. 4 -2·5 mm. longae. *Valvulae* valvae $\frac{1}{2}$ aequantes, in dorso curvatae, carinis viridibus superne minute scaberulae. *Lodiculae* 0·25 mm. longae. Antherae breves, oblongae, 0·3–0·4 mm. longae; filamenta 0·6 mm. longa. *Styli* 0·2 mm. longi; stigmata 0·6 longa. *Caryopsis* oblonga, stylopodio paulo incrassato coronata, ad 1 mm. longa, alboviridula. *Semen* pallidum, 0·8 mm. longum, 0·3 -0·35 mm. latum, 0·15 mm. crassum. *Ectrosia? mutica*, Hack. ex Probst in Mitteil. d. naturforsch. Ges. Solothurn, 5, xvii. Ber. 1911–1914, p. 169 (1914), **nomen tantum.**

Switzerland. An alien grown from wool refuse at Derendingen Mill, near Solothurn, Probst, 1918.

As the filaments grow never beyond the stigmas, the small anthers are more or less in contact with them, and as moreover the florets appear to open very imperfectly, autogamy would seem to be ensured, and even cleistogamy may occur; but I have seen the tips of stigmas protruding laterally from the florets, so that xenogamy is not altogether excluded. The pollen grains measure about 25 μ in diameter and may be seen sending out their pollen tubes among the stigmatic hairs.

While this article was going through the Press a copy of Dr. Probst's Zweiter Beitrag zur Adventiv- und Ruderal-flora von Solothurn und Umgebung (in Mitteil. naturf. Ges. Solothurn, 6. xviii. Ber. 1914–1919) was received, containing a reproduction of an excellent photograph of the grass in $\frac{1}{2}$ nat. size. This shows the grass forming a compact tuft and about 5 dm. high including the inflorescence. This agrees with the specimen examined. On the other hand the inflorescences shown in the photograph are only 12–14 cm. long with the branchlets tightly appressed to the axis, forming a false spike of not more than 3 mm. in diameter, whilst the largest of the leaves is 18 cm. by 4·5 mm. The illustration is intended to accompany the enumeration of *Thellungia advena*, Stapf, gen. et spec. nov. on p. 17.

1. Inflorescence and barren shoot (nat. size). 2. Branch of inflorescence. 3 ×. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Upper floret (one half of valve removed). 7. Flower with one half of valvule. 8. Lodicule, 35 ×. 9. Ovary, after flowering. 10. Grain, cut open, to show the loose seed inside. 11. The same, cross section. All other figures × 15.

XIII.—QUERCUS AEGILOPS.

C. C. LACAITA.

The generally recognised identity of *Quercus Aegilops* L. with the Vallonea*, or Valonia, oak of Greece and the Levant has recently been doubted for the reason that Linnaeus calls the leaves glabrous and assigns Spain, where the Vallonea does not grow, as the habitat of his species. The latter doubt derives some additional support from the fact that the two sheets in the herbarium marked *Aegilops* in Linné's own hand are unquestionably *Q. faginea* Lam., and at least one of the two was sent by Baron Alstroemer from Spain, as appears from the letter A written close to the specimen by Linnaeus. But he did not receive these specimens till long after the publication of the Species Plantarum in 1753; so they do not account for the habitat "Hispania."

I am afraid that we shall have to admit that Linnaeus never saw the Vallonea oak, whether alive or in herbarium specimens, and that in compiling an account of the species—*more suo*—from earlier writers he overlooked the admirable description in Tournefort's Voyage and even that in Miller's Figures of Plants, whilst copying an earlier mistake of Miller's and adding one of his own as to the glabrous leaves. Nevertheless, there is good justification for using the name *Quercus Aegilops* L. as a comprehensive term for the oak which supplies the Vallonea of commerce, without attempting to restrict it to any one of the more specialised forms of the trees that furnish that article, such as *Q. macrolepis* Kotschy, *Q. graeca* Kotschy, etc., whatever may be the systematic value of those forms, for the simple reason that neither Linnaeus nor the earlier authors were aware of these distinctions, and that Linnaeus did not have any one of them before his eyes.

The interpretation of Linnean names in the Species Plantarum is based on several elements:—

(1) The diagnosis and observations.
(2) The synonyms quoted.
(3) The habitat assigned.
(4) The specimens in the Linnean herbarium.
(5) His own earlier work; the Hortus Cliffortianus.
(6) The specimens of the Hort. Cliff. in the British Museum.

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* Vallonea, usually spelled Valonia by English authors, is the trade name under which the acorns and cups of this oak come from Albania, Greece and the Levant. The origin of the name is disputed. I am inclined to think that the form Valonia is derived, as usually supposed, from *βάλανος*, the old Greek word for acorn, which in modern Greek has become *βαλάνι* or *βαλανίδι* (the tree being *βαλανιδιά* or *βελανιδιά*), names which appear as Velani and Velanida etc. in the accounts of western travellers. On the other hand Parmigiani, Vocab. Etimol. della Lingua Italiana, rejects any connection of the name Vallonea with *βάλανος*, and in that form it more probably comes from the Albanian town of Vallona, which is a centre of export. The Vallonea oak is plentiful in the district and is called Vallanit. It is tempting to connect the name of the town also with *βάλανος* but this will not do, for Vallona is only the Italian corruption of Avlona, the ancient name being Aulon (*Αὐλών*) not Apollonia, as supposed by Ray, Hist. p. 1387. Apollonia was a different place, also in Albania, but inland, some distance north of Vallona, at a spot now known as Pollona or Pollina.

In the present case nos. 5 and 6 fail us for there is no reference to *Q. Aegilops* in the Hort. Cliff. The definition in Sp. Pl. (1753). p. 996, is *Q. foliis ovato-oblongis glabris serrato-repandis*, repeated in ed. 2 (1763), p. 1414, with the alteration of *serrato-repandis* to *serrato-dentatis*. In both editions follows "nascitur calyce maximo." The habitat assigned is *Hispania*. The synonyms are in ed. 1: (1) Quercus calyce echinato, glande majore. Bauh. Pin. 420; (2) Cerri glans Aegilops aspris Bauh. hist. i. p. 77 *fructus*. It is important to note that the reference to J. Bauhin's Historia is limited to the *fructus*. The second edition, whilst repeating these two synonyms, adds Mill. Dict. t. 215 to the diagnosis, as if that diagnosis were Miller's, whereas it is Linné's own, including the alteration to *serrato-dentatis*.

Now although the diagnosis by itself is utterly insufficient for any possible identification, the observation "calyce maximo" at once narrows the field to the Vallonea and some similar oaks, excluding all oaks that grow in Spain, but agreeing with the synonyms, which, as will appear, undoubtedly refer to the Vallonea. On the other hand, "foliis glabris" either excludes the Vallonea, or must be neither more nor less than a mistake on the part of Linnaeus. The leaves of Vallonea oaks, though glabrous, or almost, on the upper surface, are invariably pubescent beneath. Miller, Gard. Dict. ed. vii. (1759), says "leaves on their underside a little downy" and in Fig. Pl. (referred to by Linnaeus for the figure), "covered on their under side with an almost imperceptible hoary down." These remarks should have called Linné's attention to the matter in his second edition, though of course they were not before him when he wrote "glabris" in the first. Martelli in Nuov. Giorn. Bot. It. xx. p. 428 (1888) suggests that *Q. Libani* Olivier, which has glabrous leaves, and especially its var. *callicarpa* Kotschy, should be regarded as the type of *Q. Aegilops* L. But there are fatal objections to this proposal; there is no evidence that Linnaeus had ever seen or heard of the *Libani* oak; it does not remove the difficulty of the supposed Spanish habitat; and the ordinary Vallonea acorn or cup of commerce, on which the earlier synonyms of Linnaeus were based, comes from countries where *Q. Libani* does not grow. I have failed to trace any passage in the earlier authors which could have suggested to Linnaeus that unfortunate "foliis glabris," and have little doubt that he was only speaking of the upper surface and did not in 1753 know anything about the lower surface.

The reference to Miller's Figures of Plants is all-important. The plate in question, drawn by his brother-in-law Ehret, bears the date of 21st February, 1758, though the title-page of the volume is dated 1760. It is quite a good representation of the Vallonea oak with unripe acorns. No doubt the sharply serrated leaves of this figure were what induced Linnaeus to alter his description of him in Sp. Pl. ed. 2. The text, vol. ii. p. 143, states clearly that the tree grows in the Levant, and is practically identical with the account of it in Gard. Dict. ed. vii. (1759), repeated almost verbally in ed. viii. (1768).

Miller knew this oak well. He declares (Fig. Pl. loc. cit.) that the greater part of the trees then in England had been raised in

the Chelsea Garden in 1748. It appears in the first edition of the Gardener's Dictionary of 1731 as *Quercus* (no. 5) *calyce echinato, glande majore* C. B. P., and is alleged to have been originally brought to England from Spain. This, of course, is a mere mistake of Miller's. He was not infrequently mistaken as to the origin of seeds he received. He adds, "this is preserved by such as are curious in the collecting the several kinds of trees," words which seem to imply that he did not himself possess it at Chelsea at that date; therefore we cannot be sure that Aiton, Hort. Kew. iii. p. 359 (1789), and Smith, Rees' Cyclop. xxix. (1819), are correct in their statement that Miller had grown the Vallonea in 1731, a statement which seems to rest on this passage in the dictionary. The identical words of the 1731 edition are repeated in all subsequent editions up to and including the sixth of 1752, which is the latest that Linnaeus could have seen before the Species Plantarum of 1753.

Linnaeus probably adopted from Miller's early editions the grave error as to the native country of *Aegilops*, which, in addition to the "*foliis glabris*," led to his false determination of the (fruitless) specimens in the herbarium, but it is strange that he should not have also followed Miller in the correction of the mistake, which was made in the interval between the first and second editions of the Species Plantarum, for in the seventh edition of the Gardener's Dictionary (1759) all is changed. No. 5 of the earlier editions becomes no. 9, "*Quercus foliis ovato-oblongis glabris, serrato-repandis* Lin. Sp. Plant. 996. *Q. calyce echinato, glande majore* C. B. P. 420. The ninth sort grows naturally in the *Levant*, from whence the Acorns are annually brought to *Europe*, where they are used for dyeing; these are called *Velani*, and the tree *Velanida* by the *Greeks*. It is one of the fairest species of oaks in the World . . . . The Acorns have very large scaly Cups, which almost cover them; the Scales are ligneous and acute-pointed, standing out a quarter of an inch; some of the Cups are as large as middling Apples. The leaves are stiff, of a pale green on the upper side, and on the under side a little downy."* No allusion to Spain; no apology for the previous mistake, possibly out of regard for Linnaeus, who had fallen into the same error.

How, then, came Linnaeus to overlook this admirable account in his second edition, where he actually quotes Miller's figure? I can only suggest that he had just received the specimens from Alstroemer, who was in Spain between 1760 and 1764, and having labelled these, in the absence of fruit, *Aegilops*, took them as evidence that *Aegilops* really grows in Spain.

Smith rightly referred the two specimens to *Q. faginea*, writing on the sheets, *more suo*, "Nequaquam; *faginea* ex descr. Willd.

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* It seems incredible that in the face of this description Rouy, Fl. Fr. xii. p. 314, should have made such a serious mistake as to quote "*Q. Aegilops* Mill. Dict. ed. vii. no. 7, non. L." as synonymous with *Quercus lanuginosa* Thuill. =*Q. pubescens* W. Apart from the wrong identification, he seems unaware that the 7th edition of the Gardener's Dictionary employs no binomials, which were not adopted by Miller before the 8th ed. of 1768. M. Rouy cannot have looked at the Dictionary which he professes to quote; nor is this the only instance of his misinterpretation of Miller.

no. 68." He repeats this determination in Rees' Cyclopædia under *Q. faginea*. One of the specimens is figured by Loudon in Arb. & Frut. Brit. iii., p. 1926, fig. 1816, to represent *Q. faginea* Lam. They seem to correspond admirably with Cavanilles' plate of *Q. valentina*, Ic. ii. t. 129 (1793), identified by Willkomm in Prodr. Fl. Hisp. i, p. 240, with *Q. faginea* Lam. (1783). This plate shows how very unlike the acorns of *faginea* are to those of the Vallonea.

The eighth edition of the Gardener's Dictionary (1768) merely repeats what had been said in the seventh, only adopting the Linnean binominal *Quercus Aegilops* and altering *dentato-repandis* to *dentato-serratis* in accordance with the second edition of the Species Plantarum.

All modern authors who carry weight, such as Smith in Rees' Cyclop. xxix, Hooker in Trans. Linn. Soc. xxiii. p. 384 ("On three Oaks of Palestine"), and Boissier, Fl. Or. iv. p. 1171, adopt the identification of *Q. Aegilops* L. with the Vallonea without discussion or reference to the herbarium specimens. A. de Candolle, Prodr. xvi. i. p. 45, considers the Linnean name to include *Q. macrolepis* Kotschy and *Q. graeca* Kotschy, as well as *Q. Vallonea* Kotschy of the Taurus; all these producing the Vallonea acorns of commerce, but he is wrong in excluding from this interpretation the old synonyms relied on by Linnaeus. Solander, too, in his MSS. in Mus. Brit., vol. xix., p. 317, in a description of the species remarks, "*Q. Aegilops* Sp. Pl. 1414 exclusis synonimis praeter Milleri." Probably this hesitation as to the old synonyms (which can mean nothing else than the Vallonea) was due to the fact that the early authors, and especially Jean Bauhin, though not Caspar, mixed up the Vallonea and the Turkey oaks as forms of "Cerrus Plinii." Linnaeus probably adopted the name Aegilops from our old botanists rather than directly from Pliny. It is a transliteration of the *αἰγίλωψ* of Theophrastus, the identity of which need not be discussed here, because it is from Pliny, not Theophrastus, that our early botanists, ignorant of Greek, took their notions, often misunderstanding even Pliny, as they seem to think that he speaks of *Aegilops* as a kind of *Cerrus*. He does nothing of the sort. What he says is (Hist. Nat. xvi. 8), "Glandem . . . . ferunt quercus, aesculus, cerrus, ilex, suber . . . . glans optima in quercu . . . . cerro tristis, horrida echinato calyce, ceu castaneae." The comparison of the chestnut shows that his *Cerrus* was *Q. Cerris* L., and could not be, or include, the Vallonea. Pliny evidently knew these five acorn-bearing trees as natives of Italy, but *Aegilops* is only introduced later in the same chapter in the words of Theophrastus, "excelsissima autem aegilops, incultis amica," without being connected in any way with the five previously mentioned acorn-bearers; indeed, Pliny only seems to have known it through the Greek author. In c. 13, speaking of parasitic growth, he returns to *Aegilops* only to translate that author's account of the lichens that *αἰγίλωψ* bears.

The earliest account of the Vallonea (*Aegilops*) and Turkey (*Cerris*) oaks as distinct seems to be in Lobel, Stirp. Obs., p. 584 (1576), where the two woodcuts very fairly represent the difference in the acorns, but the leaves of both are shown as identical.

The same woodcuts, as usual with all those that issued from Plantin's Antwerp press, are repeated in Lobel's later books, in Dodoen's Pemptades (1583), and even in Parkinson's Theatrum (1640). Dodoens follows Lobel's distinction of the two oaks, but Dalechamp, Hist. Plant., p. 6 (1587), again confused them—although Lobel says that he had been taught by Dalechamp—as "Aegilops Idaeorum, Latinorum Cerrus, Italorum Cerro, Gallis ignotum arbor."

To come to the two Bauhins: Caspar in 1623 (Pinax, p. 420) distinguishes quite clearly between his Quercus vi. and his Quercus vii. No. vi. is "echinato glande majore" with synonyms "Cerris Plinii majore glande Lob." and "Aegilops sive Cerris majore glande Dod.", and the remark, "hisce glandibus ad pannos atro colore inficiendos gallorum vice utuntur," which fixes the species with certainty as the Vallonea. No. vii. "calice hispido glande minore = Aegilops minore glande Dod. = Cerris Plinii minore glande Lob. = species quae in Etruria Farnia Caesalp." is with equal certainty *Q. Cerris* L., the Turkey oak.

Jean, on the contrary, Hist. Plant. i. pt. 2, p. 77 (1650), again mixes up the two trees, repeating Dalechamp's, not Lobel's, woodcut, and remarking that he cannot quite understand the passage in Lobel. But the single acorn, which alone is relied on by Linnaeus, who has so carefully said "fructus" in quoting this author, is plainly that of the Vallonea. It is, therefore, clear that the Bauhin synonyms should not, any more than that of Miller, be excluded from those of *Q. Aegilops* L.

Tournefort seems to be the first western traveller who has described the Vallonea oak in its native country. He says (Voy. i. p. 334 (1717)) that in the island of Zia (Ceos) "on recueille beaucoup de *Velani* (which name he derives from *βάλανος*); c'est ainsi qu'on appelle le fruit d'une des plus belles espèces de Chêne qui soit au monde," and gives a full and excellent account, quoting as its name *Quercus calyce echinato, glande majore* C. B. P. The export of "Valanea" from Smyrna is mentioned by Pococke, Descrn. of the East, ii. 2, p. 38 (1745), and Olivier, Voy. dans l'Empire Othoman (1801), has a good plate (Atlas tab. xiii.) by Redouté of a branchlet and acorn. In vol. i. p. 254, he says, "les Grecs modernes nomment vélani (de *βάλανος* gland) et les botanistes *Quercus Aegilops* le chêne qui fournit la vélanide.

Elwes and Henry, Trees of Great Britain, v. p. 1271, whose plate no. 322 shows the *Aegilops* at Lyndon Hall, Rutland, the finest in England, give statistics of the export of Vallonea from Greece, and state on the authority of Mr. Wood, for many years British Consul at Patras, that in that district only the cup is sent when the acorn is ripe, but that "camata" and "camatina" are unripe fruits esteemed for their colour. Mr. Wood has kindly sent me the following further details. The word "camata" is derived from *χάμου* (*χαμαί* in literary and ancient Greek), "on the ground," meaning the acorns with their cups that are gathered off the ground after they have dropped from the tree. The diminutive "camatina" is applied to the unripe fruit gathered from the tree at an earlier stage. Camatina in trade commands a higher price, being more effective for dyeing and tanning. The

value of Vallonea, which at one time varied between £20 and £25 per ton, fell to such an extent during the years before the war that export—from Patras, at any rate, had almost ceased, but during the war the price rose again.

Lobel, loc. cit., fancied that he had seen the Vallonea oak in central Italy; "hujus speciei observasse memini publica via qua itur Pesaro Romam." His memory deceived him; he can only have seen the Turkey oak there (or possibly *Q. pseudosuber*), as is pointed out by the accurate Ray, Hist. ii. p. 1387 (1688), who knew that tree in Italy, whereas he had only seen the acorns of the Vallonea at Venice, imported from Vallona.

The only spot in Italy where the Vallonea oak has any claim to be indigenous is near Tricase, in the extreme heel, where a fine group on the steep coast of the Adriatic has every appearance of being native, but as it is quite isolated, one cannot feel sure that it was not planted of old.

XIV.—THE GENUS ROSMARINUS.

W. B. Turrill.

The genus *Rosmarinus* is limited to the Mediterranean Region, where it occurs in the southern parts of the European countries bordering this sea, in North Africa and as far east as Cyprus, the Troad, and also Cilicia, according to Boissier, Flora Orientalis, vol. iv. p. 636. Most systematists have limited the genus to one species, namely, *Rosmarinus officinalis*, L., although about twelve plants have been given specific rank by various authors. The following revision of the genus is based mainly on the excellent material preserved in the Kew Herbarium.

Rosmarinus, *L.*, Gen. Pl., ed. v. p. 14, n. 38 (1754); Benth. Gen. et Spec. Labiat. p. 314 et in DC. Prod. vol. xii. p. 360; Benth. et Hook. f., Gen. Plant., vol. ii. p. 1197; Briquet in Engler u. Prantl, Pflanzenfam., 3 A. p. 216.

Rosmarinus officinalis, *L.*, Sp. Pl., ed. 1, p. 23 (1753); Briquet, Les Labiées des Alpes Maritimes, p. 179 (1891).

This species is the common rosemary and may be subdivided as follows:—

var. **genuina**, *Turrill*, var. nov. *Frutex* erectus, usque ad 6–10 dm. altus, ramosus. *Folia* linearia, saepissime circiter 2–3 cm. longa, margine revoluta, subtus tomentosa. *Inflorescentiae* 1–2 cm. longae, pulverulentae vel subtomentosae vel subglabrae: bracteae lanceolatae vel lanceolato-ovatae; pedicelli circiter 3 mm. longi. *Calyx* campanulatus, circiter 5 mm. longus, glandulis sessilibus instructus, puberulus vel breviter tomentosus. *Corolla* circiter 1 cm. longa vel major.

Distr. Portugal, Spain, Balearic Islands, South France, Italy, Sicily, Malta, Dalmatia, Croatia, Istria, Switzerland, Greece, Crete (ex Halácsy, Conspect. Fl. Graec. vol. ii. p. 491), Macedonia (probably an escape from cultivation), Canaries, Azores, Madeira, Cyprus, Troad, Cilicia (ex Boissier, l.c.), Tunis, Egypt (ex Muschler, Man. Fl. Egypt, vol. ii. p. 829—var. *pubescens*, Pamp. ?).

forma **erectus,** *Pasq.* ex Bég. in Fiori e Paoletti, Fl. analit. d'Italia, vol. iii. p. 14 (1903). Suffrutex erectus.

Distr. As for the var. *genuina*.

forma **humilis,** *Ten.*, Syl. Fl. Neapol. p. 16 (1831); forma *procumbens*, Pasq., Fl. Vesuviana, p. 79 (1869); var. *prostratus*, Pasq. in Cat. del Real Ort. Bot. di Napoli, p. 91 (1867); var. *rupestris*, Pasq. ex Bég. l.c. Suffrutex prostratus, ramis diffusis.

Distr. Italy, and probably elsewhere.

forma **albiflorus,** *Bég.* l.c. Corolla alba.

Distr. Italy, and probably elsewhere.

var. **rigidus,** *Car. et Saint-Lag.*, Etude des Fleurs, p. 657 (1889); Rouy et Fouc., Fl. de France, xi. p. 249 (1909). *R. rigidus*, Jord. et Four., Brev. pl. nov., fasc. i. p. 43 (1866). Suffrutex robustus, caulibus rigidis, ramis erectis, foliis plus minusve erectis virentibus, corolla grandiuscula.

Distr. Southern France, Italy, Spain.

var. **angustifolius,** *Guss.*, Syn. Fl. Siculae, vol. i. p. 20 (1842); *R. angustifolius*, Mill., Dict., ed. 8, no. 1 (1768); var. *angustissimus*, Fouc. et Mand. in Bull. Soc. Bot. Fr., vol. xlvii. p. 95 (1900); Rouy et Fouc. l.c. *R. tenuifolius*, Jord. et Four., l.c. Suffrutex erectus, foliis patulis tenuibus circiter 1 mm. latis obscure virentibus, corolla grandiuscula.

Distr. Southern France, Italy, Corsica.

var. **latifolius,** *Bég.* l.c. *R. latifolius*, Mill., l.c. no. 2; Rouy et Fouc. l.c. *R. flexuosus*, Jord. et Four., l.c. p. 44. Suffrutex caulibus flexuosis, ramis patulis contortisque, foliis patulis latiusculis margine vix revolutis.

Distr. Southern France, Italy.

var. **pubescens,** *Pamp.* in Bull. Soc. Bot. It., 1914, p. 16 et Pl. Tripolit., p. 16 (1914). I have not seen this plant, but the original description is as follows: Inflorescentiae dense pubescentes, nec puberulae ut in typo et varietatibus nonnullis nec tomentoso-villosae ut in var. *lavandulaceo* (*R. lavandulaceus*).

Distr. Tripoli: Mesellata, Tarhuna, Gariau (ex Pampanini).

forma **roseus,** *Pamp.*, l.c. Flores rosei.

Distr. Tripoli: Tarhuna (ex Pampanini).

Rosmarinus laxiflorus, *de Noé* in Balansa, Pl. d'Algerie, in 1852, no. 443 (with printed Latin description); Lange, Pug., p. 178 (1863); Willkomm et Lange, Prod. Fl. Hisp. vol. ii. p. 419 (1870). *R. officinalis*, var. *laxiflorus*, Munby, Cat. Pl. Alg., 1859, p. 24; ed. 2, 1866, p. 27; Battandier et Trabut, Fl. de l'Algerie.

Suffrutex prostratus, ramis plus minusve contortis. *Folia* linearia, circiter 1·6 cm. longa et 2 mm. lata, margine revoluta. *Inflorescentiae* 2–3 cm. longae, laxiflorae; bracteae ovatae, apice acuminatae, 1·5 mm. longae; pedicelli 5 mm. longi. *Calyx* campanulatus, 4 mm. longus, leviter puberulus et glandulosus. *Corolla* 7–8 mm. longa.

Distr. Algeria: Santa Cruz, Oran; Djebel-Santo, Oran.

Spain: Cordoba; Cartagena (ex Willkomm et Lange, l.c.).

Rosmarinus lavandulaceus, *de Noé* in Balansa, Pl. d'Algerie, 1852, no. 444 (with printed Latin description); Debeaux in Mém. Assoc. Franç. avanc. sci. Oran, 1888, p. 312. *R. officinalis*, var. *lavandulaceus*, Munby, Cat. Pl. Alg., 1859, p. 24; ed. 2, 1866, p. 27; Battandier et Trabut, l.c., p. 690 (1890); Debeaux, Fl. de la Kabylie, p. 293 (1894).

Suffrutex prostratus (?). *Folia* 1·5 cm. longa vel minora, 1 mm. lata, valde revoluta. *Inflorescentiae* compactae, multiflorae, 2·5–3·5 cm. longae; bracteae subrotundae, 2 mm. longae, acutae; pedicelli usque ad 3 mm. longi. *Calyx* tubulosus, 4 mm. longus, dense albo-tomentosus et pilis longis tenuibus haud glandulosis instructus. *Corolla* 1 cm. longa.

Distr. Algeria: plain of Andalous, near Oran; Cape Falcon, near Oran; Arzew, east of Oran; Colesh.

R. lavandulaceus.

R. Tournefortii.

Rosmarinus Tournefortii, *de Noé* ex Battandier et Trabut, Fl. de l'Algerie, p. 690 (1890), nomen; *R. officinalis*, var. *Tournefortii*, de Noé in Billot flor. gall. et germ. exsic. no. 2124: *Rosmarinus eriocalix*, Jord. et Four., Brev. Pl. Nov., fasc. i. p. 44 (1866).

Suffrutex subprostratus, ramis contortis. *Folia* 1·5–2 cm. longa, 2 mm. lata, margine valde revoluta. *Inflorescentiae* usque ad 3·5 cm. longae, breviter pubescentes et pilis longis apice glandulosis instructae; bracteae late ovatae, apice obtusae vel abrupte breviterque acuminatae, 3 mm. longae; pedicelli usque ad 5 mm.

longi. *Calyx* tubulosus, 6 mm. longus, breviter pubescens et pilis distinctis tenuibus glanduloso-capitatis praeditus. *Corolla* 1·2 cm. longa.

Distr. Algeria: Sidi-bel-Abbis, near Oran; Sehdon, near Oran; Mettili.

According to Captain Hilton-Simpson the Arabic name for this plant is Khlil.

XV.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS XCVI.

951. **Miliusa dolichantha,** *Craib* [Anonaceae-Miliuseae]; a *M. Roxburghiana,* Hook. f. et Thoms., foliis subtus molliter pubescentibus, alabastris elongatis angustis distinguenda.

Ramuli primo densius brunneo- vel purpureo-brunneo-pubescentes, mox puberuli, demum glabri, cortice striato-reticulato cinereo obtecti. *Folia* plerumque oblonga vel oblongo-lanceolata, apice longius acuminata, acumine ipso acuto vel obtusiusculo, basi parum inaequilatera, cuneata vel rotundata, 6·5–20 cm. × 2·8–7·4 cm., chartacea, supra in costa densius pubescentia, ceterum glabra, subtus praecipue in costa nervisque molliter pubescentia, nervis 9–12 supra inconspicuis subtus prominentibus, venis transversis longis subtus prominulis, petiolo circa 3 mm. longo suffulta. Flores plerumque gemini, axillares (saepissime ex axillis foliorum delapsorum), pedicello et calyce et petalis externe ferrugineo-pubescentibus, pedicello 7–8 mm. longo paulo supra medium bracteola 8 mm. longa lineari-lanceolata basin versus bracteola minore instructo. *Sepala* aperta, anguste lanceolata, 1 cm. longa, 1·5 mm. lata, acuta. *Petala* exteriora sepalis similia nisi paulo breviora, interiora valvata, in alabastro vix 2·5 mm. longa. *Stamina* 6–7– seriata.

Eastern Himalaya. Abor Hills: Ringing and Rotung; 450 m.; flowers in December, *Burkill* 36606, 37593, 37674.

952. **Vatica Shingkeng,** *Dunn* [Dipterocarpaceae-Vaticeae]; *V. lanceolatae,* Blume affinis, sed foliis longe acuminatis et sepalis 2 auctis differt.

Arbor elata, glabra. *Cortex* crassus, griseo-brunneus, ramis lenticellatis. *Folia* alterna, lanceolata, longe acuminata vel caudata, basi rotundata, 9–18 cm. longa, chartacea, nervis 6–paribus ascendentibus trabeculis numerosis parallelis connexis subtus prominulis, petiolis 0·6–1 cm. longis. *Flores* ignoti. *Capsula* tarde dehiscens vel indehiscens, 2 cm. longa, globosa, breviter acuminata, in calyce persistente aucto patente insidens, sepalis 2 exterioribus ovatis obtusis striatis 3 cm. longis, interioribus 1–1·5 cm. longis. *Semina* angulata, pauca.

Eastern Himalaya. Abor Hills: Rengging to Janakmukh:

forming pure forests of considerable size; Abor name Shing-keng. *Burkill* 36254, 36615, 37311, 37453.

953. **Rubus** (§**Malachobatus**) **Burkillii,** *Rolfe* [Rosaceae-Rubeae]; species distincta, e serie *Pacatorum*, Focke, ramis et petiolis aculeatis, foliorum lobis rotundatis, et floribus saepe corymbosis distinguenda.

Fruticosus, ramulis et petiolis aculeatis et cinereo-villosis. *Folia* suborbicularia, breviter 3–5 lobulata, basi cordata, breviter inciso-crenata, puberula, nervis reticulatis primariis parce aculeolatis, 5–9 cm. longa, 5–8 cm. lata; petioli 1–3 cm. longi; stipulae angustae, laciniatae, 5–7 mm. longae. *Flores* terminales et axillares, saepe corymbosi, 3–7 conferti. *Pedicelli* 5–7 mm. longi, puberuli. *Calyx* campanulatus, circiter 1 mm. longus, 5-lobus; lobi deltoideo-ovati, acuti, lateribus filamenis binis subulatis 2 mm. longis instructi. *Petala* obovata, 5–6 mm. longa. *Filamenta* 3–4 mm. longa. *Drupae* paucae, subsiccae, rugosae; styli 2 mm. longi.

Eastern Himalaya. Abor Hills: Kibo, *Burkill* 37005.

A very distinct species of the section *Malachobatus*, and apparently belonging to Focke's small series *Pacati*, which has hitherto only been known from China. It cannot be placed in the series *Rufi* from the character of the pubescence, and no very closely allied plant has been found at Kew.

954. **Eugenia aborensis,** *Dunn* [Myrtaceae-Myrteae]; *E. formosae*, Wall. similis foliis subsessilibus cordatis, sed foliis floribusque duplo minoribus longe distans.

Arbor glabra, 10 m. alta. *Folia* oblongo-lanceolata, acuminata, subsessilia, basi cordata, saepe amplexicaulia, 14–23 cm. longa, membranacea, integra, nervis multis gracilibus approximatis intra marginem anastomantibus infra prominulis, glandulis crebre punctata. *Flores* in cymis paucifloris terminalibus axillaribus vel lateralibus dispositi, 2 cm. diametro. *Calyx* late urceolatus, 8–9 mm. diametro, dentibus 5 latis brevibus. *Petala* rotundata, 6 mm. diametro. *Stamina* 5 mm. longa. *Stylus* 1·3 cm. longus. *Fructus* immaturus, globosus, 1 cm. diametro.

Eastern Himalaya. Abor Hills: Balek and near Kebang; 700 m.; flowers in December and January. Abor name Ponkar. *Burkill* 36433, 36633, 37245, 37118.

955. **Begonia aborensis,** *Dunn* [Begoniaceae]; affinis *B. silhetensi*, C. B. Clarke, sed habitu robustiore, floribus bis majoribus distincta.

Herba dioica (?), acaulis. *Rhizoma* repens. *Foliorum* petioli ad 80 cm. longi, lineis multis albis notati, ut nervi primarii, laminarum paginae inferiores, pedunculi, sepala, capsulaeque molliter rubropilosi; laminae nitentes variegatae, oblique cordato-ovatae, acuminatae, ad 30 cm. longae, bullatae, obscure sinuatae, denticulatae, supra glaberrimae. *Pedunculi* ad 20 cm. longi. *Flores* lucide rosei, 4–5 cm. diametro. *Flores* ♂ multi, rotundati, umbellati; bracteae oblongo-ovatae, 2–3 cm. longae; pedicelli 4–5 cm. longi; sepala 2, rotundata vel ovata, 2 cm. longa; petala

paulo breviora, angustiora; stamina indefinita, libera, 7 mm. longa, antheris 2 mm. longis. *Flores* ♀ 1–3- ni; sepala et petala ut in ♂; styli 3, basi coaliti, 7 mm. longi; stigmata ramosa. *Fructus* globosus, 1·8 cm. diametro, 4–locularis, fissuris multis irregularibus verticalibus dehiscens.

Eastern Himalaya. Outer Abor Hills: frequent on old overgrown clearings and extending just on to the plains as far as Lokpur; rarely in the forest, flowering in January; above Rotung, 300 m.; above Babuk, 1200 m.; between Kebang and the Dihong, 600 m., *Burkill* 36023, 36132, 36138, 36225, 36700, 36833, 36906, 37530, 37622, 37663, 37794, 36825.

Mr. Burkill sent living material of this species to the Lloyd Botanic Garden at Darjeeling when the plant was discovered. It grew there and produced flowers, specimens of which preserved in formalin were recently sent by the Curator, Mr. Cave, to Kew. These consisted of a large cluster of leaves interspersed with male flowering stems in all stages of development. The species is probably dioecious.

956. **Begonia Burkilli,** *Dunn* [Begoniaceae]; affinis *B. Roxburghii*, A.DC., sed flores multo majores.

Herba acaulis, omnino glabra. *Rhizoma* repens. *Foliorum* petioli 7–12 (–18) cm. longi; laminae maculis nigrescentibus saepe notatae, oblique cordato-ovatae vel lanceolatae, acuminatae, 10–20 cm. longae, sinuato-dentatae vel saepius integrae. *Florum* ♂ pedunculi 4–15 cm. longi, superne ramosi, 3–8 flori; pedicelli graciles, 3–5 cm. longi; bracteae membranaceae, oblongo-caudatae, 1–2 cm. longae; sepala 2, pallide rosea vel alba, obovata vel oblanceolata, acuta, 3–4 cm. longa; petala angusta, duplo breviora; stamina indefinita, libera, 7 mm. longa, antheris 2 mm. longis. *Flores* ♀ solitarii, in scapis gracilibus 4–5 cm. longis; sepala et petala ut in ♂; styli 2, basi coaliti, 8 mm. longi, ramosi. *Fructus* rhomboideus, utrinque acutus, 2 cm. longus, 1·5 cm. diametro, 4–locularis, cornubus duobus parvis in medio ornatus.

Eastern Himalaya. Abor Hills: frequent on rocks by streams in the outer hills; 300—1000 m. *Burkill* 36121, 36315, 36910, 37121, 37139, 37375, 37455, 37706. The ♀ flowers are said to appear about three weeks after the ♂.

957. **Begonia iridescens,** *Dunn* [Begoniaceae]; affinis *B. Griffithii*, Hook. f., sed foliis majoribus, breviusque petiolatis distincta.

Herba monoica, acaulis. *Rhizoma* breve, crassum. *Folia* saepius duo, magna, humo adpressa, iridescentia, glauca, maculis argenteis elongatis inter nervis notata, oblique late ovata, breviter et obtuse acuminata, 20–35 cm. longa, obscure undulata, supra subglabra, subtus viridia, venis venulisque brunneo-tomentosis; petioli breves, 3–8 cm. longi, brunneo-hirsuti. *Flores* ♂ et ♀ in pedunculis (3–) 6–12 (–43) cm. longis superne copiose ramosis ut sepalis fructibusque parce rubro-hirsutis; bracteae multae, squarrosae, lanceolatae, 5 mm. longae; sepala rosea 1–1·5 cm. longa, ovato-oblonga, obtusa, superius saepe cucullatum: petala breviora, spathulata; stamina numerosa, 3 mm. longa,

erecta, libera, antheris 1·5 mm. longis; styli 2, basi coaliti. superne ramosi. Fructus bilocularis, ala una lineari, 1 cm. longa, a stylis distante et de eis directa, valvis lateraliter dehiscentibus.

Eastern Himalaya. Abor Hills: very plentiful about Rengging and in the Lalik valley; growing flat against rocks or on the ground in deep shade, 500—1700 m. Flowers in January. *Burkill* 36111, 36246, 36247, 36270, 36673, 36831, 37315, 37336.

The stamens are said usually to be directed upwards under the hooded sepal.

958. **Begonia scintillans,** *Dunn* [Begoniaceae]; *B. Regi*, Putzeys, affinis, sed repens et foliis superne hispidis.

Herba monoica, acaulis. *Rhizoma* longum, gracile, ex nodis fasciculos radicum fibrosorum et saepe etiam folia 1–3 et pedunculos emittens, ubique ut petioli paleis rubidis vestitum; internodiis plerumque 4–5 cm. longis. *Foliorum* petioli 5–10 cm. longi; laminae saepissime maculis parvis albis inter nervis aggregatis pulcherrime ornatae, oblique rotundato-cordatae, acuminatae, 6–10 cm. longae, minute dentatae, supra virentes, pilis bulbosis crebre vestitae, subtus coccineae, rarius pilosae. *Flores* in pedunculis 3–12 cm. longis saepius terni, 2 ♂, 1 ♀. extus sparse pilosi; pedicelli graciles, 2–3 cm. longi; bracteae lanceolatae, acutae, 5 mm. longae. *Flores* ♂: sepala inaequalia, ovata. obtusa, majora 2 cm. longa, corallina; petala concoloria, duplo minora; stamina libera, numerosa, 3 mm. longa, antheris 1 mm. longis. *Florum* ♀: sepala et petala ut in ♂ at paulo minora: styli 3, basi coaliti, 4 mm. longi, stigmatis tortuosis. *Fructus* immaturus rhomboideus, utrinque obtusus, 1 cm. longus, 6 mm. diametro, 3-alatus.

Eastern Himalaya. Abor Hills: plentiful about the mountain of Bapu, both on the south face and towards Rotung; 1200—2000 m. *Burkill* 36219, 36543, 36820, 36928.

959. **Sadiria Boweri,** *Dunn* [Myrsinaceae-Myrsineae]; *S. Griffithii*, Mez affinis, sed glabra petiolisque longioribus.

Frutex ramosus, glaber, ramulis gracilibus quasi herbaceis. *Folia* ovata, apice acuminata, basi obtusa, integerrima vel undulato-dentata, 10–14 cm. longa, glandulis rubris praecipue prope marginem conspersa, nervis 12–13-paribus subtus prominulis, petiolis saepe 1·5–5 cm. longis. *Flores* in cymis brevibus 1·5–2 cm. longis deflexis axillaribus densis aggregati, deorsum directi. *Sepala* 5, basi breviter coalita, triangularia, margine. serrulata, 1–1·5 mm. longa, aperta. *Petala* 5, integra, per $\frac{2}{3}$ longitudinis in tubo coalita, lobis contortis ovalibus, incarnata. *Stamina* 5, petalis paulo breviora, filamentis brevissimis petalis basi affixa. *Ovarium* globosum, stylo gracili petala paulo excedente: stigma punctiforme; placenta ovata, uniseriatim 5-ovulata. *Fructus* ignotus.

Eastern Himalaya. Abor Hills: summit of Bapu; 2000 m., *Burkill* 36929.

Named at Mr. Burkill's request in honour of Major-General Sir Hamilton Bower, K.C.B., who planned and carried out the expedition to the Abor Hills on which these plants were collected.

960. **Arundinella intricata,** *Hughes* [Gramineae-Arundinelleae]; affinis *A. brasiliensi,* Raddi, sed panicula minore magis contracta, axibus ad angulos dense et manifeste ciliatis, glumis latioribus magis abrupte acutis, gluma inferiore $\frac{3}{4}$ spiculae aequilonga, aristae columna plerumque breviore differt.

Perennis, dense et intricatim caespitosa. *Culmi* erecti vel geniculati, 30–60 cm. alti, stricti, glabri, 4–10-nodi, supra basin ramis foliosis erectis. *Foliorum* vaginae firmae, apertiusculae, laeves, striatae, marginibus dense ciliatae, inferiores persistentes; ligulae brevissimae, truncatae, interdum in dorso dense fimbriatae; laminae lineares, in acumen longe attenuatae, 0·5–2·2 cm. latae, planae vel involutae, rigidulae vel subflexuosae, glabrae vel supra nonnunquam pilis paucis dissitis, in margine scabrae. *Panicula* ovata vel oblonga, contracta, 6·5–12·5 cm. longa, 1–2 cm. lata; axis primarius acute angulosus atque sulcatus, angulis marginatis dense conspicueque ciliatis; rami solitarii vel 2- nati, inaequaliter dispositi, paniculam dimidiam aequantes; pedicelli 0·5–2 mm. longi, ciliati, apice discoidei. *Spiculae* hiantes, 4 mm. longae; gluma inferior ovata, acuminata, interdum setaceo-acuminata, 3 mm. longa, distincte 3–5- nervis; superior ovata, acuta vel acuminata, apice leviter recurva, 4 mm. longa, 5–nervis. *Inthoecium inferum* ♂, raro ovario rudimentario addito; valva ovata, acuta vel acuminata, recta vel subrecta, 4 mm. longa, 5–nervis; valvula ovato-oblonga, acuta, 3 mm. longa, carinis infra marginatis supra scaberulis, flexuris tenuissime ciliatis; antherae 1·5 mm. longae. *Inthoecium superum* ♀; valva oblonga, obsolete bifida, 2·5 mm. longa, chartacea, minutissime scaberula; valvula anguste oblonga, 2 mm. longa, inter carinas scaberula.

Khasia Hills. Maosmai; 1220 m., *Clarke* 16588: Mahadeo; 915 m., *Clarke* 155622: Amwé; 1220—1525 m., *J. D. Hooker:* Boga-Panee; 1220—1830 m., *J. D. Hooker* 2001.

Abor Country. Dihang River; bank near Ritung; 30 m., *Burkill* 373.

"A grass which makes tussocks, and in places quite clothes the bank above the river. It mats its tussocks together with its roots which come out at the top of the soil as well as run all through it." (Burkill.)

This was probably included in *A. brasiliensis*, Raddi, by Hooker in his Flora of British India, p. 73, but he does not quote any of the specimens enumerated here.

XVI.—MISCELLANEOUS NOTE.

Mr. W. G. Craib, F.L.S., Lecturer on Forest Botany and Indian Forest Trees in the University of Edinburgh (*K.B.*, 1915, 355), and formerly Assistant for India in the Herbarium at Kew (*K.B.*, 1909, 225), has been appointed by the Crown, Regius Professor of Botany in the University of Aberdeen in succession to the late Professor J. W. H. Trail, F.R.S.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4] [1920

XVII.—ON THE SELECTION OF HEVEA BRASILIENSIS.

In the *Kew Bulletin*, 1919, p. 317, a review was published of the paper by Mr. Stafford Whitby on "Variation in *Hevea brasiliensis*." The results of the investigations detailed in this paper cannot fail to be of considerable value in any attempts which may be made to improve the types of *Hevea* grown by means of seed selection. The following account dealing with the selection of *Hevea brasiliensis* in the Dutch East Indies has been very kindly prepared by Mrs. F. R. Durham from the paper written in Dutch by Dr. C. Heusser, the botanist on the staff of the Rubber Planters' Association, East Coast of Sumatra at Medan, Sumatra, the General Experiment Station of the A.V.R.O.S. (Algemeene Vereeniging van Rubberplanters ter Oostkust van Sumatra). Dr. J. G. J. A. Maas, Agricultural Assistant at the same station, has also published a paper on the Vegetative Propagation of *Hevea* in 'Archief voor de Rubbercultuur' iii. no. 7, a translation of which is given in the Tropical Agriculturist, vol. liv. no. 1, 1920, p. 2. In this paper the various methods of budding, grafting and striking by means of cuttings are described in some detail.

Dr. Heusser's paper is reprinted from the 'Archief voor de Rubbercultuur,' vol. iii. part 1, of July 1st, 1919, and is issued as a Report from the General Experiment Station of the A.V.R.O.S. Rubber Series, no. 21.

In the year 1914 Dr. Cramer drew attention to the necessity of selecting *Hevea*, and urged that further introductions of fresh material should be made from the Amazonian region,* basing his suggestions on the experience gained in the cultivation of Cinchona.

* Rubber Recueil. Internat. Rubber Congres. Batavia, 1914, p. 13, and Official Report, p. 23.

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Bauer* in the same year explained the scientific principles on which the selection of *Hevea* should be based. He also advocated the introduction of fresh types from Brazil, in addition to selection from among the *Hevea* plants cultivated in the East Indies. There are thus two points of view under consideration :—

1. Selection from the trees at present in the East Indies.
2. Importation of new types from Brazil.

The first method would mean the improvement of the existing plantation *Hevea*, for a better stock of plants would be raised by the selection and cultivation of a healthy and high-yielding strain of plants.

The prospects of selecting a good strain from local trees are encouraging. The variation in yield of latex between good and bad yielders is very great, and the latter predominate. From the statistics it appears that the greater part of the total yield of a plantation comes from the good trees which are in a minority. A striking example of individual variation in yield is afforded by one of the selected trees, compared with its neighbours. The plantation is 14 years old. In 1917 the selected tree gave on an average 85 grammes of latex per day, and in 1918 the yield was 70 grammes. (Average of 12 monthly observations.) This tree had been conspicuous even earlier by its high rate of yield. The highest daily yield in those two years was 150 grammes, the lowest 42 grammes. Other trees of this same plantation yielded on an average 8 grammes per day, while many only gave 3–4 grammes, though grown under the same conditions as the selected tree and apparently equally as well developed.

The yield of this tree is about ten times as great as that of an average tree in a good modern plantation, and it appears to be due entirely to some individual peculiarity of the tree. Trees yielding 30 grammes per day may be seen on some ten-year old plantations (*i.e.*, four times the average daily yield). Thus, as Stafford Whitby showed, there exists among plantation *Hevea* trees good material for selection offering every chance of success.

Two methods of selection may be adopted :—

1. *Generative Selection.* Pure strains of high-yielders may be gradually raised from the mixture of good and bad trees by crossing high-yielders during many generations.
2. *Vegetative Selection.* The good qualities of high-yielders may be perpetuated by grafting and by means of cuttings.

Generative Selection.—Seed selection is on the whole the better method; but it is essential that both the parents should be high latex-yielders. The crossing of good-yielders can be carried out by hand, or seed nurseries may be formed in isolated localities. Bauer recommends nurseries composed of trees grafted from good parent trees of both sexes.

A good method of forming seed nurseries is by grafting high-yielders on strong year-old stems. Stocks grafted with two

* Die Fortschritte der Vererbungsforschung und ihre Bedeutung für die Züchtung tropischer Kulturpflanzen besonders der Kautschukpflanzen. Official report of the Internat. Rubber Congres. Batavia, 1914, appendix 3, p. xxx.

different high-yielders should be planted as far away as possible from other Heveas. The nursery would then consist of two physiological individuals, and natural cross-fertilisation should result. A plantation of grafted trees from more than two female parents is not to be recommended—it becomes impossible to check the origin of the second generation, and the question of selection is unduly complicated.

The seed from these nurseries will furnish a small percentage of descendants as good as, or possibly even better than, either parent. The best trees raised are then planted out in fresh nurseries. In each succeeding generation the quality of the seed will improve.

A plan of the nursery is given by Dr. Heusser, showing the trees grafted from the two individuals in unequal numbers; so that should self-fertilisation occur, the fewer trees of one individual can be cut out without disadvantage. The plants are spaced 9 m. by 9 m. apart.

Artificial crossing of good-yielders may be carried out in the plantation, if an isolated nursery cannot be made, and there is the further advantage that the first nursery generation would thus be avoided. In practice, however, it is laborious. In order to reach the flowers of the female parent the erection of light scaffolding is generally necessary. Before the opening of the female flowers, the inflorescences must be enclosed in a gauze balloon. The flowers always open about 1 o'clock, and those that have not opened by 4 p.m. will not expand until the next afternoon. In order to shorten the time of the unnatural confinement in the balloon, the latter is only applied late in the forenoon and fertilisation is begun at 3 p.m. Female flowers that open before the balloon is applied must be pinched off. Fertilisation is effected by breaking off a stamen from the male blossom with a pair of forceps and applying the pollen to the stigma. This operation should be repeated once or twice with fresh stamens, to ensure that ripe pollen is applied to the stigma. Pollen may be taken from male flowers in bud as the anthers dehisce before the flower opens. After fertilisation the orifice of the flower is closed with a small plug of kapok, to exclude further pollen. The bristles of the corolla and a small quantity of escaped latex hold the plug in place. The plug is cast off with the corolla when the flower dies, and does not hinder the development of the fruit.

Any remaining flower buds must then be pinched off and the twig marked with a zinc label. The fruits must be picked singly before bursting to prevent confusion, and to make certain that they are the product of one particular tree (see in this connection *K. B.*, 1919, p. 318).

The main objection to selection by seed is the long waiting period before a highly productive strain can be established. Before a young *Hevea* reaches seed-bearing age some 3–5 years must elapse, and even then a tree cannot be relied on with any certainty.

A second factor that may handicap the work of seed selection is the manner in which characters are inherited. It appears that high latex production is the result of several factors, and that if

a good-yielder is to be produced there must be a favourable combination of the necessary hereditary characters. The relative scarcity of high-yielders (1–2 per cent.), and possibly the very gradual range from these to non-yielders, lends support to this view.

When once the stock has become more homogeneous, favourable combinations will be more easily obtained, the isolation of any particular character could then be brought about by self-fertilisation.

There is yet a third difficulty, since *Hevea* is fertilised by insects and appears to be practically self-sterile. Petch records a tree which stood entirely isolated and had never been known to bear fruit. A similar case, though not absolutely reliable, is known from the east coast of Sumatra. Cramer reported in 1914 that artificial self-fertilisation, as described above, applied to over 300 flowers of one tree failed completely. The fruit-setting was likewise poor (7 per cent.), after artificial fertilisation with pollen from other trees. This may be comparable to the facts well-known to fruit growers, that some trees, though they flower profusely set no fruit, while others are highly fertile.

In the case of one of these fertile trees, four out of 95 self-fertilised flowers set their fruit, whilst of 78 cross-fertilised flowers 19 set fruit. Self-fertilisation, therefore, is possible in fertile trees as Mr. J. G. J. A. Maas demonstrated in 1917. Further trials will, however, be needed to prove that enough seed can be obtained by this method for selection on a large scale, and also to ascertain whether the descendants remain constant. In practice, fertilisation with foreign pollen must be undertaken, and nurseries must be so arranged that with favourable results one of the two individual trees can be removed.

Propagation by seed is thus a lengthy process, but it must not be neglected, and should, if possible, be undertaken in experiment stations.

1. Nurseries should be established with trees grafted from two female parent trees, and natural cross-fertilisation should be relied upon.

2. Artificial cross-fertilisation (eventually self-fertilisation) of good-yielders should be carried out where it is not possible to form isolated nurseries.

The same rules which apply to the selection of the character of high latex production may be followed for any other advantageous qualities, such as resistance to disease, thickness of bark, etc., in so far as these may be hereditary.

Vegetative selection.—A rapid improvement in the strain of *Hevea* as regards latex yield may be obtained by vegetative methods of propagation.

The stock of a high-yielder may be multiplied by grafting or budding on less valuable stock. Technically it is very easily done; there are several good methods, especially Forkert grafting.*

The value of such grafted plants, having a poor-yielder for their root-stock and a good-yielder for their crowns, must be tested

* Van Helten: The Grafting of Hevea, Archives for Rubber culture No. 1, 2nd Vol. 1918, p. 637.

by trial tappings. The results are said to be excellent where the latex is formed in the stem and crown; and also to be good where the latex is formed all over the tree;* but *nil* when it is formed in the root-stock. The observation that the latex vessels are relatively more numerous and larger in the tissues of the root than in the stem and branches leads to the conclusion that the roots act as reservoirs for the latex, and similar conclusions were come to by Arisz as the result of his experiments.

Propagation by cuttings (*Ringing or Marcottage*). This is the safer and more rapid method of obtaining a stock of plants from a good-yielding tree.

Two objections are often raised against propagation by cuttings:—

1. The difficulty of obtaining good stock for cuttings.
2. The bad root development which it is alleged is found in cuttings, and often results in the loss of the tap root.

While the difficulty about the roots is inconsiderable, the first point is a more serious one.

This obstacle may be overcome by the establishment of nurseries for providing cuttings in which strong year-old trees may be grafted with scions from the best yielder in the plantation. A ten-year old tree would easily furnish 200–500 grafts.

The shoots from these grafts, as soon as they have the thickness of a finger, are suitable for cuttings. The secondary buds of the grafts should be allowed to shoot, so that the tree may become shrubby and so furnish a succession of material for cuttings.

The striking of the cuttings may be done in the native manner known as "Marcottage." A ring of bark 2 cm. wide is removed, and the cambium is scraped off from the area so ringed; the ringed portion is then wrapped up after being covered with earth and fibre.

This method is easier to check and simpler to carry out, if a small bamboo basket without a bottom is placed round the ringed space and filled with clean fine sand and, if necessary, watered daily. If the ring is made more than 50 cm. from the ground an easily removable basket can readily be devised.

According to the experience of planters the best place for ringing a branch is just below a bud, as roots are more readily produced at such a spot.

Dr. Heusser considers the objections about the roots of the cuttings to be largely prejudice, and he figures a very well rooted eight-weeks' old cutting. The three chief roots produced by this cutting could no doubt develop into good tap roots, just as in any plant where the primary tap root is broken off secondary roots will take its place. Tap roots always form where they are needed, and where the water-level permits it. On low-lying plantations there are always more trees without than with tap roots. The significance of the tap root for the plant diminishes with its age, and with the strengthening of the side roots. It is true that the stability of a tree, especially of a young tree, is greatly decreased by the breaking off of the tap root, but in the case of rubber each

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* See Bobiloff, Archives for Rubber Culture, March, 1919.

† Archives for Rubber Culture, July, 1918.

tree is of so much value that it is advisable to give the young trees some support.

The cuttings should be severed as soon as the first two or three roots have reached a length of 3 cm., which may take place in some five or six weeks. After removal of the cuttings the cut surfaces must be covered with tar or paraffin, and the cuttings planted out either as bare stumps or with the majority of the leaves removed. It has been found that root growth is stimulated by watering with dilute lime water.

Dr. Heusser goes on to say that this method of selection is limited by the physiological "life" of the original tree. For the life period cannot be lengthened by grafting or by taking cuttings. However young a cutting may be, and however young may be the stock on which the graft is made, as soon as the parent tree reaches the end of its natural "life," all its descendants will die as well. He adds that we have no certain information as to the physiological life of *Hevea*, but that it is to be feared it is not a very long one.*

The Choice of Trees to be used for Selection.—1. *A high and constant yield of latex* is the chief desideratum in a tree to be used for selection purposes. On the figures of the daily yield of latex taken for several months, and, if possible, on days when an abnormally high or low yield is not anticipated (not on rainy days), the first selection may be based. Further, the quality of the tree is judged by—

2. *State of Health.* Trees giving abnormally high yields from disease must be neglected, or only considered after recovery. Gnarled or twisted trees should not be used.

3. *Good Hereditary Qualities.* It must be remembered that high latex yield depends not only on good inherited qualities, but also on such other factors, as soil, age, size, and the competition it may have with neighbouring trees. The yield must be judged in relation with that given by the trees growing under the same conditions.

The second point in the programme of selection, the introduction of new types of *Hevea* from South America, may be of great importance in the future. We know that our cultivated East India *Hevea* comes from the Tapajoz region on the right bank of the lower Amazon. A better variety of *Hevea brasiliensis* is said to exist near the upper course of the Rio Purus and Rio Madeira.† Besides, more than 20 species of *Hevea* have been described, the value of which for cultivation is but imperfectly known. *Hevea brasiliensis* is justly regarded as the best of its kind. Our high producers, to use Dr. Cramer's expression, are veritable "Ledgerianas" (in Quinine culture *C. Ledgeriana* is the highest producer).

It must, however, be remembered that there may be species of

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* Whether Dr. Heusser's statement has any foundation in fact remains to be proved. The only plant in which something of the kind is known to occur is the Bamboo, but many cases are known in which trees grafted from some particular 'sport' or seedling variety still exist in a healthy and active state of growth though the original tree has long since died.—*Ed.*

† Tapajoz rubber, Acre rubber. See Cramer Rubber Recueil, 1914.

Hevea as yet untried, any of which may also have its "Ledgerianas." Besides, it is worth while to find out whether other advantageous qualities, such as qualities of the rubber, geographical adaptability, etc., are present in the sorts which might give good results either by themselves or by crossing.

The establishment of a standard garden, containing every type of the genus *Hevea*, would place inexhaustible material at the disposal of the plant breeder, and steps in this direction have been taken by Dr. Cramer in the establishment of the selection station at Buitenzorg.

XVIII.—GARDEN NOTES ON NEW OR RARE TREES AND SHRUBS.

W. J. Bean.

Cladrastis Wilsonii, *Takeda* [Leguminosae.]

Two of the most interesting trees introduced by Mr. Wilson from China are two species of *Cladrastis*, viz., *C. sinensis* Hemsley (see *Kew Bulletin*, 1913, p. 164) and *C. Wilsonii*. Both belong to the true *Cladrastis*—as distinct from *Maackia*, which by Bentham and Hooker was united with it. Previous to the comparatively recent discovery of these two species and another Japanese one, *Cladrastis* was only known by a single species found in the Eastern United States, the well-known "Yellow wood," *C. tinctoria*. *C. Wilsonii* is fairly common in the moist woods of Western Hupeh, but rare in Kiangsi. Farther west it is replaced by *C. sinensis*. In cultivation *C. Wilsonii* is extremely rare, and we have but one plant at Kew; this was obtained from the Arnold Arboretum in 1910. It is possible that it may be in cultivation elsewhere under Wilson's number 1102.

C. Wilsonii is a tree 15 to 50 ft. high, the trunk up to $1\frac{1}{3}$ ft. in diameter. Its leaves are deciduous, 9 to 13 in. long, pinnate, with nine to fifteen leaflets on each leaf. Leaflets ovate to elliptic, $1\frac{1}{2}$ to 3 in. long, $\frac{1}{2}$ to $1\frac{1}{4}$ in. wide, the terminal one the largest. (On the wild specimens collected in China and preserved in the Kew Herbarium the leaflets are fewer on each leaf but individually larger, often 4 in. long and 2 to $2\frac{1}{2}$ in. wide.) They are dark green above, sub-glaucous beneath, and at maturity glabrous except on the short stalk. The flowers (not yet seen in cultivation) are white, about 1 in. long and borne on lax, terminal, many-flowered panicles 12 to 16 in. long. From *C. sinensis*, this species is distinguished by its densely pubescent ovary, large flowers, and broader leaves. Both have the axillary leaf-buds hidden and enclosed by the swollen base of the leaf stalk, a character which gives a ready distinction between the true *Cladrastis* and *Maackia*.

New Magnolias.

Magnolia conspicua var. **purpurascens,** *Maximowicz;* (M. denudata var. purpurascens, Rehd. et Wils.) [Magnoliaceae].

Amongst the numerous trees and shrubs introduced to this

country from China by Mr. Wilson, there are few which will attract plant-lovers more than his new Magnolias. In the size of their individual flowers Magnolias surpass all other trees or shrubs that we can grow in the open air, and it may be safely said of them all, even the least attractive, that they are well worth growing.

For more than a hundred years, the yulan, or lily-tree, *M. conspicua*, has been one of the most valued of our hardy trees, and a new form of it is sure to be greatly welcomed. First named and described by Maximowicz in 1872, it was not until about 1900 that Mr. Wilson obtained seeds of the var. *purpurascens*. From them were raised plants in the Coombe Wood Nursery which are now well established in cultivation at Kew and elsewhere. The "Wilson-Veitch" number is 688. It is evidently a big tree in Western Hupeh, for Mr. Wilson found it as much as 65 ft. high with a trunk 6½ ft. in girth. In the shape and leathery texture of the adult leaves it is very similar to the ordinary *M. conspicua*. They are mostly obovate, much the broadest towards the apex, where is a conspicuous mucro, and pubescent on and near the midrib and chief nerves beneath. The flower is erect, very shortly-stalked, and at first clasped at the base with large, very hairy bracts. Mr. Wilson says the flowers, as seen by him in China, vary in colour from rosy red without to rose or pale pink within. On April 12th, 1919, I was fortunate to see this Magnolia in flower in the grounds of Caerhays Castle. There it was of a beautiful soft but glowing pink, distinct in shade from any other Magnolia I had seen, but approaching *M. Campbellii* probably more than any other.

Magnolia Dawsoniana, *Rehder et Wilson.*

There is very little to be said of this species at present, but as two grafted plants under the name have recently been received at Kew from Messrs. Chenault of Orleans, who had obtained it from the Arnold Arboretum, it may be worth while to put its introduction on record. Mr. E. H. Wilson discovered it in 1908 in Western Szechuen, near Tachien-lu, at altitudes of 6500 ft. to 7500 ft. There is, therefore, a good prospect of its being hardy in this country. It is a tree from 25 to 40 ft. high, glabrous in leaf and twig. The leaves are of firm, leathery texture, obovate or elliptic, 3½ in. to 6 in. long and about half as much wide, shining green above, the leafstalk ½ to 1¼ in. long. The flowers are unknown, but the fruit is cylindrical, 4 in. long by 1½ in. wide. with orange-scarlet coated seeds.

This Magnolia is rare, and at present is only known from the remote locality where Mr. Wilson collected it in 1908 and again in 1910. He and Mr. Rehder suggest that it is most closely allied to *M. conspicua* (*M. denudata*, Desrousseaux). Another species with the qualities of that wonderful tree would be a great acquisition.

Magnolia Nicholsoniana, *Rehder et Wilson.*

Along with the preceding species, Kew is indebted for this new and very rare Magnolia to Messrs. Chenault of Orleans. It was

discovered by Mr. Wilson in Western Szechuen at altitudes of 7500 to over 9000 ft. It ought then to be perfectly hardy with us. It is a deciduous shrub or tree from 12 to 20 ft. high, the slender young shoots at first clothed with brown hairs, becoming purplish and glabrous the second year. The leaves are elliptic-oblong or slightly obovate, 3 to 5 in. long, $1\frac{1}{2}$ to 2 in. wide, acute at the apex, broadly wedge-shaped to rounded at the base, glabrous and dull green above, slightly glaucous and at first sparsely hairy beneath, except on the midrib, which is densely clothed with brown hairs; the petiole is slender and $\frac{1}{2}$ to $1\frac{3}{4}$ in. long. The cup-shaped flower comes with the young growth and expands in June: it is white, fragrant, 3 to 4 in. wide, the petals obovate, broad or even rounded at the apex and 1 in. wide; stamens red. The fruit is cylindrical, 2 in. long, seeds scarlet-coated.

According to Mr. Wilson, *M. Nicholsoniana* is very rare in a wild state and is only known to occur in moist thickets and woodlands on and around Wa-shan. It belongs to the same group as *M. Wilsonii*, but differs from that species in its longer leaf-stalks and much less hairy leaves. It is named in honour of the late George Nicholson, Curator of Kew, 1885–1901.

Magnolia Sargentiana, *Rehder et Wilson.*

Judging by the statements made by Mr. Wilson, based on his observations of this tree as seen by him growing wild in Western Szechuen, it must be naturally one of the most magnificent of all Magnolias. He met with it frequently 50 to 65 ft. high, and one specimen he saw in 1903 near Wa-shan was over 80 ft. high with a trunk nearly 10 ft. in girth. Five years later, when he made a special journey to photograph this tree, he found, unhappily, that it had been cut down. The species appears to be most closely allied to the Himalayan *M. Campbellii*, whose splendid blossoms are fairly well known in the milder parts of the British Isles. The flowers have not yet been seen, or, at any rate, described, by any European, but Mr. Wilson was informed by the Chinese that they were rosy red to rosy pink and about 8 in. across. The leaves are deciduous, obovate, tapered towards the base, 4 to 7 in. long, $2\frac{1}{2}$ to 4 in. wide, smooth above, densely villose beneath. The fruit is apparently very handsome, being cylindrical, 4 to $5\frac{1}{2}$ in. long, pink, with scarlet-coated seeds.

M. Sargentiana was sent to Kew from the Arnold Arboretum in 1911, at the same time as *M. Wilsonii*, but it does not thrive so well. Probably, as its native altitudes are 1000 to 2000 ft. lower than those of *M. Wilsonii*, it may not be so hardy. It ought to be tried in the south-western counties, and is, indeed, succeeding very well at Caerhays. We find it can be propagated by cuttings of half-ripened leafy shoots.

Magnolia Wilsonii, *Rehder.*

In its general appearance, this Magnolia has a considerable resemblance to *M. parviflora*, and it promises to be equally as beautiful a shrub in gardens. It was discovered by Mr. Wilson in 1904, in Western Szechuen, south-east of Tachien-lu, at altitudes of 7000 to 8500 ft., but the plants in cultivation at Kew

were raised from seeds collected by him in the same region four years later. In a wild state it is usually a shrub up to 10 ft. high, but is occasionally seen as a small tree more than twice as high; the young wood is dark brown, clothed at first with pale brown hairs. The leaves are lanceolate to narrowly oval, slenderly pointed, rounded to broadly wedge-shaped at the base; 3 to 6 in. long, 1½ to 3 in. wide, dull green and glabrous above, soft and velvety beneath, with a dense covering of pale brown, silky hairs; petiole ½ to 1½ in. long. The fragrant flower is borne at the end of the young leafy shoot and opens in late May and June. The petals are pure white and, being incurved, give a flower of cupped shape. Each flower is about 3 in. in diameter, and is made additionally attractive by the ring of bright red stamens in the centre. The flower stalk is 1 to 1½ in. long, clothed densely with pale brown hairs and circled midway by a conspicuous scar left by a deciduous bract. Fruit, cylindrical-ovoid, 2 in. long by ¾ in. wide. The species is well distinguished from *M. parviflora* by the greater hairiness of the leaves, leafstalks and flowerstalks; the leaves, too, of *M. parviflora* are broader and less tapered at the apex, and the flowerstalk is nearly twice as long as in the present species.

M. Wilsonii flowered for the first time at Kew last June. It appears to be perfectly hardy here, but has grown much more rapidly and reached the flowering state sooner in Cornwall, Mr. P. D. Williams sent a flower to Kew in 1917 from his garden at Lanarth in that county, and I believe it had flowered there previously. The flower is pendulous, and this character, as Mr. Williams has observed, will be very attractive in specimens tall enough for the richly-coloured stamens to be seen from below.

Quercus alnifolia, *Poech.* [Cupuliferae.]

Although introduced to Kew as long ago as 1885, this interesting oak still remains perhaps the rarest of the cultivated evergreen species. It is a small tree, often a shrub, and is found wild on the mountains of Cyprus up to 500 ft., usually as underwood in pine forests. It is evergreen, its leaves very stiff and leathery, obovate or nearly orbicular, entire or (in young trees especially) sharply toothed; on cultivated plants they are usually 1½ to 2 in. wide, but on wild specimens up to 3 in. The upper surface is dark glossy green, but on the lower one the leaf is covered with a rich, tawny golden tomentum, a character which distinguishes this oak from all others in cultivation, and is only rivalled among hardy trees by the golden chestnut of California—*Castanopsis chrysophylla*. The golden colour is most beautiful whilst the leaf is young; with age it becomes yellowish-grey. The acorns are slender and somewhat truncheon-shaped, 1 to 1½ in. long.

The best plant at Kew was, until recently, growing in the Temperate House, but it is quite hardy, and has been transplanted to the open air. It was originally raised at Kew from acorns sent by Sir Robert Biddulph, High Commissioner for Cyprus from 1879 to 1886. It is very desirable that the species should be reintroduced, and if this should meet the notice of any one in a position to obtain acorns, tree-lovers in this country would be

gratified if the opportunity were taken to send some home. The tree is apparently not uncommon in Cyprus, for Kotschy states that the acorns were collected by the monks of the Greek monasteries, dried, and used for mixing with the winter fodder of their domestic animals.

Quercus cleistocarpa, *Seemen.* (*Lithocarpus cleistocarpa,* Rehder and Wilson.)

In regard to size of individual leaf this is the finest of the oaks introduced from China. Acorns were sent home by Mr. E. H. Wilson in 1901, when he was collecting for Messrs. Veitch, and plants raised at Coombe Wood under his seed number 1204 are now in cultivation at Kew and elsewhere. It is evergreen and apparently quite hardy. But how much it appreciates a climate milder than the average one of this country is shown by a tree growing in Mr. J. C. Williams' woods at Caerhays, in Cornwall, as compared with plants at Kew. Here it is a shrub, slow-growing and with leaves up to 6 in. long only, whereas in Cornwall the tree has a slender erect stem and bears leaves well over 1 ft. long by 3 or 4 in. wide. All the leaves are perfectly glabrous, cuneate at the base, with an acuminate apex, and are rather greyish-green in hue. The acorn-cups are $\frac{3}{4}$ to 1 in. wide, densely clustered on a stiff spike 2 to 3 in. long, the acorns almost entirely enclosed. It may be long before they are produced in this country, but as a fine-foliaged tree it is well worth cultivation in the milder counties. Wilson found it in Western Hupeh as a tree 40 to upwards of 50 ft. high.

Rhododendron hippophaeoides, *Balfour fil. et W. W. Smith.* [Ericaceae.]

This charming Rhododendron is one of Mr. Forrest's discoveries. He found it as a shrub 4 to 5 ft. high in open situations in Alpine scrub on the mountains of Yunnan, China, at an altitude of 12,000 ft. From seeds presented by Mr. J. C. Williams in 1915, a good stock has been obtained at Kew. As represented by these young plants, the species is of erect, rather slender growth, the young branches furnished the whole of their length with leaves. The leaves are narrowly oblong or oblanceolate, 1 to $1\frac{1}{2}$ in. long and $\frac{1}{4}$ to $\frac{3}{8}$ in. wide, tapered at the base, rounded but with a small mucro at the apex; they are dull, dark green above, pale greyish-brown beneath, both surfaces covered with scales. The leaf, when crushed, has a slightly acrid odour. The flowers are borne, seven or eight together, in terminal clusters. The corolla, $\frac{3}{4}$ to 1 in. wide, with five rounded spreading lobes, varies considerably in colour. Mr. Forrest describes the flowers as "blue, drying a lavender blue," "pale bluish rose," and "deep purplish blue." On one plant at Kew they are pink. The calyx is pale green, scaly, distinctly five-lobed; ovary scaly; style glabrous; stamens with a ring of pubescence near the base; anthers brownish red.

The species is thriving well at Kew, and flowers both in autumn and in spring. This year, the mild weather of February and early March brought out the flowers earlier than usual, and the first

crop was caught by frost. It has produced flowers at Kew during six months of the year, viz., September, October, and from February to May.

Smilax megalantha, *C. H. Wright.* [Liliaceae.]

This species was originally described by Mr. Wright in the *Kew Bulletin*, 1895, p. 118, from material collected in Szechuen by Pratt, and on Mount Omei by Faber. Mr. E. H. Wilson found it in Western Hupeh in ravines north and south of Ichang in March and December, 1907. From seeds (No. 661) collected by him and sent to Kew the following year from the Arnold Arboretum, plants were raised which have grown very well and are now established in the Bamboo Garden. As a foliage plant it promises to be the finest of all the hardy smilaxes in cultivation. It is a climber growing 10 to 15 ft. high, evergreen, with leaves varying much in size and shape. The largest are as much as 9 in. long by 6 in. wide, broadly ovate, acute, rounded at the base, firm and leathery in texture, conspicuously three-nerved, dark green above and slightly glaucous beneath. The smaller leaves are narrowly oblong to lanceolate, $3\frac{1}{2}$ in. long by $1\frac{1}{4}$ in. wide. According to Wilson the flowers are greenish and the fruit coral red. It promises to make a valuable addition to our rather scanty evergreen climbers.

XIX.—SETARIA OR CHAETOCHLOA?

O. Stapf.

In the year 1897 F. Lamson Scribner (in U.S. Dept. Agr. Div. Agrost. Bull. iv. 38) proposed the name *Chaetochloa* for the genus of grasses generally known as *Setaria*. The reasons for doing so were stated to be that "the name *Setaria* . . . which has been taken up by many botanists for a number of well-known weedy grasses with dense, spike-like, bristly panicles, was first applied by Beauvois (in Oware and Benin) to a species of *Pennisetum*", and secondly that "at an earlier date the name was employed by Acharius to designate a genus of lichens." When working out the genus *Setaria* (*Gramineae*) for the Flora of Tropical Africa I had to decide which of the two names should be taken up, and for that purpose examine their history.

It is quite true that the name *Setaria* was used for the first time by Acharius on p. 219 of his Lichenographiae Suecicae Prodromus (1798). But he proposed it to designate a "Tribus" of the genus *Lichen* and not a distinct genus. At that date Acharius was still of opinion that the time for breaking up the Linnean genus *Lichen* into smaller genera had not yet come, as the organs of fructification on which a system of genera would have to be based were still unknown. "Sin exstierint hae fructificationis partes, haud tamen sufficientem earum habemus notitiam, sine qua, secundum jam rata atque confirmata fundamenta, diversa statuere genera nec licet, nec oportet (l.c. p. x.). Others, he says (p. vii.) may take his tribus for genera ("quivis si placet, et validior subest

ratio, totidem finget genera"), but he himself saw no reason (p. viii.) why he should not follow his revered teacher (Linnaeus) in admitting only one genus, *i.e.*, Lichen ("Me certe huc usque nec propria indagatio, nec aliorum demonstrationes impulere, quin deveneranди olim Praeceptoris mei sententiam, absque omni partium studio, velut rectissimam sequar.") I have quoted those passages because the fact that he actually makes binominal quotations combining the name of the "tribus" and the specific epithet and quotes the latter in the index under the "tribus" is apt to create the impression that he meant his "tribus" to be after all "genera." Possibly he wished to prepare for the not improbable eventuality of the recognition of Lichen genera, and in that case to have the necessary specific names ready. Pending that recognition he adhered to the Linnean system, not only enumerating and diagnosing the older species, but also describing his own new species of "Lichen." The combinations mentioned occur in each case after the diagnosis, heading the synonymy and in the case of Swedish species in the same line with the Swedish name, these names being his own invention (Nomina . . . suecana . . . passim a me ficta, p. vi.) and mere translations of the specific name, *e.g.* *Lichen deustus* . . . *Umbilicaria deusta*. Svet. Svedlaf (sveda = deurere; laf = lichen).

It was, however, not long before Acharius admitted Genera in lichens. Five years later in his Methodus (p.v.) he confesses "Quod autem in specie ad Lichenum distributionem in plura Genera attinet, credo neminem vel tantillum in eorum historia versatum jam infitias iturum, eam aeque necessariam ac utilem esse" and "Sic etiam Lichenes, me quidem judice, potius Familiam vel Ordinem Cryptogamiae Classis quam Genus solum constituere sat firmis argumentis probari potest." In this Methodus *Setaria* does not occur at all. Two of the three species of the "Tribus" *Setaria*, *Lichen jubatus* and *L. chalybaeiformis*, appear under *Parmelia*, whilst the third, a doubtful lichen (*Lichen hippotrichodes*, Ach. Prodr. 220) is omitted. Nor is the name *Setaria* revived in Acharius' great Lichenographia Universalis, both "Setarias" being merged there in the new genus *Alectoria* with references to the Prodromus, but without the Setaria-binominals of that work.

There is, therefore, no reason to attribute to Acharius the authorship of a lichen genus *Setaria;* but if that is so, can Beauvois' *Setaria* as the name of a genus of grasses be rejected on the ground adduced by Scribner? The species described and figured by Beauvois in his Flore d'Oware et de Benin, ii. 80, tab. 110, f. 2, as *Setaria longiseta*, which is supposed by Scribner to be the type of his genus *Setaria*, is clearly a *Setaria* in the sense in which that genus is generally accepted. It belongs to a group characterised by typically solitary spikelets arranged in loose panicles, each of them supported by a single persistent bristle, more or less turgid, with the fertile floret rather broad-backed and dorsally much curved and by rather narrow leaf blades, not folded between the primary nerves as is the case in the section *Ptychophyllum*. It is clearly not a *Pennisetum*. I am proposing to name the

group "*Panicatrix*" in allusion to the habit of the panicle which is that of a typical *Panicum*. But whilst *Setaria longiseta* is no doubt a *Setaria*, it is not the "type" of *Setaria*. Beauvois himself (l.c.) in the heading over the description of the genus quotes "*Setaria* Ess. d'Agrost." If we turn to his Essai d'une nouvelle Agrostographie, we find (1) on p. 51 the description of the genus "*Setaria* nob.," and a list of species to be transferred from *Panicum* to *Setaria*; then (2) on p. 178 (index) an enumeration of the new names under *Setaria;* (3) on p. 9 of the "Explication" the explanation of the figure of *Setaria viridis* which is intended to illustrate the genus; and lastly (4) on tab. 13 under fig. 3 a good picture of a spike of *Setaria viridis* with equally excellent analyses. Several of the combinations on p. 178 are queried; of those without a sign of interrogation all but two are recognised members of the *Eu-Setaria* group, namely *germanica*, *glauca*, *italica*, *setosa*, *verticillata* and *viridis*, the latter of which was, as already stated, chosen by Beauvois to illustrate the genus. The two doubtful species are *S. purpurea* and *S. sericea*, both taken over from *Panicum*. Of these *S. purpurea* is probably a true *Setaria*, whilst *S. sericea* is evidently *Pennisetum setosum*.

However that may be, there can be no doubt whatever that Beauvois meant his *Setaria* to include the species of the type of *Setaria viridis*, and this will have to be considered as the foundation of the genus. Scribner's mistake in taking Beauvois' *Setaria longiseta*, the only species mentioned in his Flore d'Oware et de Benin, as the "type" of the genus arose probably from the misleading date on the title-page of the second volume of that work. This is given as 1807, that of the Essai d'une nouvelle Agrostographie being 1812. The Flore d'Oware et de Benin was actually published in parts, those of volume ii. being spread over fourteen years (1808-1821). The dates of part 11 (pages 1-12, tt. 61-66), with which vol. ii. starts is 1808, of 12 and 13 (pages 13-32, tt. 67-78) 1810 (see Hallier in Jahrb. Hamburg. Wissensch. Anst. xvii. 67), whilst it appears from a notice in Flora v. part i. (1882) Beibl. i. p. 4, that only seventeen parts had been published by 1818. According to Hiern (in Journ. Bot. 1898, p. 495) part 17 contained tt. 97-112. The date of the publication of *S. longiseta* is therefore six years later than that of the Essai d'une nouvelle Agrostographie.

So far, then, Scribner's objections to the use of *Setaria* for the grass genus of that name cannot be sustained. Unfortunately, however, the confusion does not end here. In 1803 François André Michaux in his Flora Boreali-Americana, ii. 320-332, published an account of the Lichens collected by his father André Michaux: This account (i. p. ix.) followed the arrangement and nomenclature of the "recent" publication of Acharius (Lichenum ordinem ét denominationem suppeditavit recentior Acharius), by which Acharius' Lichenographiae Suecicae Prodromus (1798) was meant. and not his Methodus (1803). Whether the latter appeared before or after the publication of Michaux's Flora I do not know, but it is clear from internal evidence that it had no influence on it. In the section dealing with the lichens Michaux follows the

plan adopted throughout the work of introducing each genus with a headline, giving the name and author and a diagnosis, after which follow the diagnoses and paragraphs with observations and a statement of the habitat. In the case of the lichens the diagnoses under the headlines are verbatim copies of the corresponding diagnoses of Acharius' "tribus," and the names in the headlines are those used to designate the "tribus," with the addition of "Ach." That Michaux actually intended to give Acharius' "tribus" the status of genera may be inferred not only from the typographical exposition which is in accordance with that adopted in the remainder of the work, but also from the fact that he forms his specific names by combining the specific epithet with the "tribus" name of Acharius, and not with the Linnean genus "lichen" as Acharius did. Now, among the "genera" recorded there, we find on p. 323 *Setaria* and as sole representative of it *S. trichodes*, both of which have to be credited to Michaux. What this *Setaria trichodes* .which the elder Michaux collected in Canada was, is uncertain. Acharius, referring to it in a note in his Lichenographia, p. 594, says "utrum huius generis (i.e., *Alectoriae*) species sit an *Alectoriae jubatae* tantum varietas, dicere non audeo," and *Krempelhuber* (Geschichte u. Literatur d. Lichenologie, ii. 551) omits it altogether from the list of new species described by Michaux in his Flora Boreali-Americana; nor is it included in part vii. of Macoun's Catalogue of Canadian Plants which deals with the Hepatics and Lichens. In fact, the only reference to it seems to be in Tuckerman's Synopsis of the North American Lichens, part i. 44, where it is quoted as a synonym of *Alectoria jubata* var. *implexa*; but Tuckerman has evidently not seen it, as he quotes only Hall's (Rocky Mountains) and Richardson's (Arctic America) collections, nor do Nylander or Fries, whom he cites for *Alectoria* and the variety *implexa* respectively, refer to it. Thus *Setaria*, Michaux, is reduced to a diagnosis taken over purely mechanically from Acharius, and an insufficient species description which is, as far as we know, not supported by any actual material in existence, and may cover or not cover a plant answering to Acharius' "tribus" *Setaria*. To supersede the well-established name *Alectoria* on such slender and purely formal grounds will not serve any useful purpose, nor would it be in accord with the spirit or even the wording of the general rules governing botanical nomenclature. But if *Setaria*, Michaux, cannot stand for *Alectoria* nor as an independent genus, then the way is free for the admission of *Setaria*, Beauv., the grass genus.

I should not have considered it worth while to deal with a mere question of nomenclature in so detailed a way if Scribner's proposal did not concern a genus with very numerous species and entail consequently a great and very inconvenient change of names without consolidating or advancing our knowledge in any way.

XX.—NEW ORCHIDS: DECADE XLVII.

431. **Eulophia Huttonii,** *Rolfe;* in Dyer Fl. Cap. vol. v. sect. iii. p. 52, anglice; affinis *E. foliosae,* Bolus, labelli lobo intermedio haud concavo et carinis ad apicem verrucosis differt.

Rhizoma validum, nodis incrassatis. *Folia* 2–3, erecta, elongato-linearia, acuta vel acuminata, crebre venosa, 15–30 cm. longa. *Racemi* densiflori, 2·5–7·5 cm. longi. *Bracteae* lanceolatae, acuminatae, 0·6–1·2 cm. longae. *Pedicelli* circiter 1·2 cm. longi. *Flores* mediocres, brunnei vel rufi. *Sepala* elliptico-lanceolata vel oblongo-lanceolata, acuta vel subacuta, circiter 1·2 cm. longa. *Petala* elliptico-oblonga, subobtusa, sepalis paullo latiora. *Labellum* circiter 1·2 cm. longum, subaequaliter trilobum; lobi laterales subdivergentes, late oblongi, rotundati; lobus intermedius late oblongus vel suborbicularis, medio ad apicem 3–5 carinatus, carinis cristatis basi tenuioribus; calcar obsoletum. *Columna* clavata, circiter 6 mm. longa.

South Africa. Stockenstrom Div.; Katberg, *Hutton,* and in numerous other localities in the Coast, Kalahari and Eastern Regions.

The species has been confused with *E. aculeata,* Spreng., and *E. foliosa,* Bolus.

432. **Eulophia Boltonii,** Harv. et Rolfe; in Dyer Fl. Cap. vol. v. sec. iii. p. 53, anglice; affinis *E. foliosae,* Bolus, labello multo breviore et obscure trilobo differt.

Rhizoma validum, nodis incrassatis. *Folia* 2–3, erecta, elongato-linearia, acuta, crebre venosa, 10–30 cm. longa, vaginis lanceolatis. *Scapi* laterales, erecti, 15–30 cm. alti, vaginis numerosis lanceolatis subimbricatis obtecti; racemi ovoidei vel oblongi, 2·5–5 cm. longi, densiflori. *Bracteae* lineari-lanceolatae, acuminatae, 0·8–1·2 cm. longae. *Pedicelli* 8 mm. longi. *Flores* mediocres, virides, labello purpureo. *Sepala* ovato-lanceolata, acuminata, circiter 1·3 cm. longa, laterales paullo majores. *Petala* elliptico-lanceolata, acuta, sepalis multo breviora. *Labellum* late ovato-orbiculare, subtrilobum, 8 mm. longum; lobi laterales breves, late rotundati; lobus intermedius late ovatus, apiculatus, brevis; discus 3–5-carinatus, carinis tenuibus laevibus; calcar obsoletum. *Columna* clavata, 2 mm. longa, basi pede distincto instructa.

South Africa. Albany Div.: Featherstone Kloof; near Grahamstown, in grassy spots on the flat summit of the hills, *Bolton, MacOwan* 681. Stockenstrom Div.; Katberg, 600 m., *Hutton.*

This species has been more or less confused with *E. foliosa,* Bolus.

433. **Lissochilus Rehmannii,** *Rolfe;* in Dyer Fl. Cap. vol. v. sect. iii. p. 55, anglice; *L. chitellifero,* Reichb. f., similis, sed labelli calcare longiore et subcurvato differt.

Rhizoma et folia non visa. *Scapi* erecti, subgraciles, circiter 30 cm. alti, basi vaginis laxis obtecti; racemi laxi, circiter

10 cm. longi, multiflori. *Bracteae* oblongo-lanceolatae, acuminatae, 4–8 mm. longae. *Pedicelli* graciles, 1·2–1·4 cm. longi. *Flores* parvi. *Sepala* elliptico-oblonga, acuta vel apiculata, 0·8–1·2 cm. longa. *Petala* ovata vel orbiculari-ovata, subobtusa vel subaciculata, sepalis duplo latiora. *Labellum* trilobum, petalis sublongius; lobi laterales breves, lati, truncati; lobus intermedius reflexus, obovatus, truncatus, subundulatus, 6 mm. latus; discus basi ad medium carinis 7 approximatis elevatis et verrucosis instructus; calcar oblongum vel lineari-oblongum, 4 mm. longum. *Columna* late clavata, 4 mm. longa.

South Africa. Transvaal; hills above Aapies River, *Rehmann* 4297; hills near Pretoria, *McLea* in Herb. Bolus 5819a; kopje at Pretoria, *Miss E. Tennant* 4040; Koodoos Poort, near Pretoria, *Reck* 1004.

434. **Lissochilus transvaalensis,** *Rolfe;* in Dyer Fl. Cap. vol. v. sect. iii. p. 57, anglice; *L. aequali*, Lindl., similis, sed labello petalis longiore et obscure trilobo differt.

Folia 3, elongato-linearia, acuminata, prominenter trinervia, 20–30 cm. longa, basi conduplicata, vaginis spathaceis imbricatis obtecta. *Scapi* laterales, erecti, basi non visa, vaginis spathaceis obtecti; racemi laxi, 10–15 cm. longi, multiflori. *Bracteae* ovatae vel ovato-lanceolatae, acuminatae, 2 cm. longae. *Pedicelli* graciles, 1·2–1·6 cm. longi. *Flores* mediocres. *Sepala* subconniventia, late oblonga, apiculata, 1·4–1·6 cm. longa. *Petala* elliptico-obovata, abrupte acuminata, sepalis paullo breviora. *Labellum* obscure trilobum, 2 cm. longum; lobi laterales breves, apice rotundi; lobus intermedius ovato-oblongus, undulatus; discus medio fere ad apicem lamellis elevatis tenuibus crenulatis infra apicem tuberculatis ornatus; calcar late conicum, obtusum, 4 mm. longum. *Columna* clavata, 1 cm. longa.

South Africa. Kalahari Region: Transvaal; Izaneen, Zoutspanberg, 830 m., *Burtt-Davy* 2900.

435. **Polystachya natalensis,** *Rolfe;* in Dyer Fl. Cap. vol. v. sect. iii. p. 65, anglice: *P. transvaalensi*, Schlechter, similis, sed labello et petalis longiore et obscure trilobo differt.

Caules aggregati, erecti, cylindrici, 7–15 cm. longi, apice diphylli, basi vaginis angustis obtecti. *Folia* oblonga, obtusa, coriacea, 5–7·5 cm. longa, 1·2–2 cm. lata. *Scapi* erecti, 5–7·5 cm. longi, 3–5-flori, vaginis angustis obtecti. *Bracteae* triangulares, acuminatae, concavae, 3–4 mm. longae. *Pedicelli* 6 mm. longi. *Flores* mediocres, olivacei vel brunneo-purpurei. *Sepalum* posticum ovato-oblongum, subobtusum, 6–8 mm. longum; sepala lateralia late triangularia, subobtusa, 1·2 cm. longa. *Petala* anguste subspathulata, apiculata, 6 mm. longa. *Labellum* spathulatum, 8 mm. longum, late unguiculatum; limbus late ovatus, subobtusus, subundulatus, 6 mm. longus; discus callo erecto quadrato ornatus. *Columna* lata, brevis, pede 6 mm. longo. *Capsulae* ellipsoideo-oblongae, angulatae, 2·5 cm. longae.

South Africa. Eastern Region: Natal; Richmond, 760 m., *Sanderson* 823.

436. **Phalaenopsis** (§**Stauroglottis**) **latisepala,** *Rolfe;* a *P. denticulata,* Reichb. f., sepalis et petalis latioribus et magis ellipticis differt.

Folia 3–4, late elliptica, obtusa vel obscure biloba, recurva, 9–12 cm. longa, 5–8 cm. lata. *Scapus* nanus, suberectus, circiter 7 cm. longus, subteres, 5–6-florus. *Bracteae* patentes, ovatae, obtusae, concavae, 3 mm. longae. *Pedicelli* 1·2–1·5 cm. longi. *Flores* mediocres. *Sepalum* posticum late ellipticum vel suborbiculari-ellipticum, obtusum, 1 cm. longum, 7–8 mm. latum; sepala lateralia suborbiculari-ovata, obtusa, 1·2 cm. longa, 1 cm. lata. *Petala* late elliptica, obtusa, 1 cm. longa, 7–8 mm. lata. *Labellum* 3-lobum; lobus intermedius anguste obovato-oblongus, obtusus, trigonus, 1·8 cm. longus, subcarinatus, prope apicem hispidus; lobi laterales lineari-oblongi, trigoni, apice bidenticulati, 5 mm. longi; discus medius appendiculo bicuspidato instructus, infra medium appendiculo lineari-oblongo incurvo 2 mm. longo instructus. *Columna* clavata, 2 mm. longa.

Habitat unknown.

Flowered in the collection of M. Roger Liouville, of Maure, Ille-et-Villaine, France, in April, 1914, when it was sent for determination through Sir Frederick W. Moore, of the Royal Botanic Garden, Glasnevin. The sepals and petals are greenish-yellow, with rows of red-brown dots, and the lip white with a purple apex. The flowers are said to be violet-scented.

437. **Phalaenopsis** (§**Stauroglottis**) **Micholitzii,** *Rolfe; P. tetraspidi,* Reichb. f., similis, sed scapis brevioribus et labelli lobo intermedio longe hirsuto differt.

Folia sessilia, obovato-elliptica, obtusa, circiter 18 cm. longa, 6–7 cm. lata, coriacea, basi cuneata. *Scapus* suberectus, flexuosus, pauciflorus (basi non visa). *Bracteae* ovato-oblongae, obtusae, cucullatae, 5 mm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* circiter 4 cm. lati. *Sepalum* posticum late ellipticum, subobtusum, circiter 2·3 cm. longum, 1 cm. latum; sepala lateralia ovato-elliptica, subacuta, 2·3 cm. longa, 1·2 cm. lata. *Petala* late elliptica, obtusa, 2 cm. longa, 1·1 cm. lata. *Labellum* trilobum; lobus intermedius anguste obovato-oblongus, carnosus, 1·5 cm. longus, basi carinatus, apice longe hirsutus; lobi laterales falcato-oblongi, oblique acuti, 5 mm. longi; discus bicallosus, callo utroque bicuspidato. *Columna* clavata, 7 mm. longa.

Malaya. Without precise locality, *W. Micholitz.*

Introduced in 1889 by Messrs. Sander, St. Albans, through their collector, W. Micholitz, and flowered in their establishment at St. Albans in the following year. The flowers are cream-white in colour, and somewhat resemble those of *P. tetraspis,* Reichb. f., but they have far longer and less numerous hairs on the lip.

438. **Angraecum** (§**Tridactylites**) **Hislopii,** *Rolfe; A. tridentato,* Harv., simile, sed foliis et floribus fere duplo majoribus differt.

Fruticosus. Caulis erectus, validus, 10 cm. altus vel major. *Folia* patentia, subteretia, obtusa, 5–7 cm. longa, circiter 3 mm.

lata; vaginae amplexicaules, 1 cm. longae, striatae et verrucosae. *Racemi* axillares, circiter 2 cm. longi, flexuosi, 2–3-flori. *Bracteae* patentes, ovatae, truncatae, amplexicaules, 2 mm. longae. *Pedicelli* 4 cm. longi. *Sepalum* posticum elliptico-oblongum, obtusum, 4 mm. longum; sepala lateralia ovata, obtusa, 4 mm. longa. *Petala* oblonga, subobtusa, 4 mm. longa. *Labellum* oblongum, supra medium tricuspidatum, 4 mm. longum; lobus intermedius obtusus, lobi laterales subacuti; calcar subfusiforme, 0·9–1 cm. longum. *Columna* lata, 2 mm. longa.

Tropical Africa. S. Rhodesia, *A. Hislop* 67.

Similar in habit to the imperfectly-known *Angraecum tridentatum*, Harv., which is a native of Natal, but larger in all its parts, and with a more elongated inflorescence.

439. **Angraecum Bolusii**, *Rolfe;* in Dyer Fl. Cap. vol. v. sect. iii. p. 73, anglice; ab *A. tridentato*, Harv., sepalis ovato-lanceolatis et labelli angulis subulatis differt.

Caules subgraciles, subflexuosi, 7–12 cm. longi. *Folia* sparsa, semicylindrica, gracilia, depressa, supra anguste canaliculata, curvata, 6–10 cm. longa, vaginis striatis. *Flores* fasciculati, pauci, breviter pedicellati, parvi, pallide flavi. *Sepala* lateralia patentia, ovato-lanceolata, acuta, 3 mm. longa, basi subcordata, apice reflexa; sepalum posticum ovatum, acutum, 3 mm. longum, recurvum. *Petala* triangulari-lanceolata, acuta, recurva, sepalis paullo minoribus. *Labellum* patens, oblongo-lanceolatum, circiter 3 mm. longum, apice trilobum, basi lobis oblongis patentibus instructum; calcar cylindricum, pendulum, 6 mm. longum. *Columna* lata, brevis; rostellum late ovatum, acuminatum; pollinia sphaerica; stipes cuneato-rhomboideus; glandula ovato-elliptica. *A. tridentatum*, Bolus, Ic. Orch. Austr.-Afr. vol. i. t. 53 (non Harv.).

South Africa. Eastern Region: Zululand; near Eshowe, *Maxwell in Herb. Bolus* 6319.

A more slender plant than *A. tridentatum*, Harv., with much broader sepals and a differently-shaped lip.

440. **Brownleea Fanniniae**, *Rolfe;* affinis *B. Galpinii*, Bolus, floribus duplo majoribus et labello latiore differt.

Herba terrestris (basi non visa). *Caulis* subgracilis. *Folia* caulina, sessilia, suberecta, lanceolato-linearia, acuminata, 6–9 cm. longa, 5–8 mm. lata. *Spicae* ovoideae, 2·5–4·5 cm. longae, densiflorae. *Bracteae* ovato-lanceolatae, acutae, 1–1·5 cm. longae. *Pedicelli* 0·8–1 cm. longi. *Flores* pallidi, petalis sparse purpureo-maculatis. *Sepalum* posticum cum petalis in galeam connivens, 8–9 mm. longum et latum, limbo late subpandurato subundulato calcare 6 mm. longo basi conico deinde subgracili; sepala lateralia elliptico-oblonga, subobtusa, 8 mm. longa. *Petala* cum sepalo postico connata. *Labellum* parvum, latum, columnae appressum. *Columna* lata, 2 mm. longa; rostelli lobi cuneato-oblongi, tridenticulati, 2 mm. longi.

South Africa. Natal; Dargle Farm, *Mrs. Fannin* 98.

Described from a specimen in the Trinity College Herbarium,

Dublin. *B. Galpinii*, Bolus, Ic. Orch. Austr. Afr. i. t. 42, fig. 9–11, from the southern slopes of Mount Currie, Griqualand East, at 1830 m., *Tyson* 1074, must be very nearly allied, but I have not seen a specimen.

XXI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM

DECAS XCVII.

961. **Rubus** (§**Idaeobatus**) **chambica**, *Rolfe* [Rosaceae-Rubeae]; a *R. concolore*, Wall. floribus minoribus saepe in racemos laxos dispositis differt.

Frutex, rami subteretes, glabriusculi, sparse aculeolati, 1–1·75 m. longi. *Folia* ternata vel rarius pinnate 5-foliolata, concoloria, 15–20 cm. longa; stipulae lineari-lanceolatae, acuminatissimae, 1–1·5 cm. longae; foliolus terminalis petiolatus, late ellipticus vel ovato-ellipticus, acutus vel breviter acuminatus, crenulatus, interdum irregulariter lobatus, 8–11 cm. longus, 5–7 cm. latus; foliola lateralia subsessilia, oblique ovata, acuta, crenulata, 5–8 cm. lata; petioli puberuli, sparse aculeolati, 7–9 cm. longi. *Racemi* terminales et axillares, pauciflori vel laxiflori, pubescentes, parce aculeolati, 3–5 cm. longi. *Pedicelli* pubescentes, parce aculeolati, 1–1·5 cm. longi. *Calyx* 5-partitus; segmenta patentia, ovata, acuminatissima, pubescentia, circiter 1·5 cm. longa. *Petala* obcordato-orbicularia, 0·7 cm. longa, alba. *Stamina* numerosa, glabra, 3 mm. longa. *Carpella* numerosissima, sparse hirsuta, 1 mm. longa; styli glabri, 3 mm. longi.

INDIA. Chamba State: Pangi; Kagal Reserve, 2250 m., *R.N. Parker*.

Said to be a shrub of moist undergrowth, with branches 3–6 ft. long, mostly but not always dying to the ground in winter. The species belongs to the group of *R. gracilis*, Wall., and is allied to *R. concolor*, Wall., which in the Flora of British India is included under the aggregate species *R. niveus*, Wall.

962. **Brassaiopsis magnifica**, *Dunn* [Araliaceae-Schefflereae] affinis *B. aculeatae*, Seem. in caule aculeato et racemis nutantibus, sed tomento foliisque peltatis differt.

Arbor 3 m. alta. *Caulis* brunneus aciculis deciduis spinisque conicis persistentibus dense tectus. *Folia* 6–7, coronam grandem super vertice formantia, peltata, 5-loba, 80 cm. longa et lata, lobis ovatis acutis caudatis ad 25 cm. longis, sinubus acutis, supra glabra, infra praecipue in nervis ut inflorescentia aurantiaco-tomentosa, margine ubique deflexo cartilagineo serrato; nervi circum umbonem 22 cm. intra basin dispositum 12, stellatim radiantes, validi; petioli 50 cm. longi, glabri. *Flores* (alabastra tantum visa) in pedunculis racemosis 7–9 cm. longis 2–5 cm. umbellatim aggregati, rachi communi 30–50 cm. longa sub foliis nutante; pedicelli 1·5 cm. longi basi bracteis 2 mm. longis interne glabris suffulti. *Sepala* et *petala* 5, valvata, triangularia. *Stamina* 5. *Ovarium* 2 (–3) -loculare, 2 (–3) -ovulatum.

Fructus maturus ovoideus glaber, 7 mm. longus, stylo 2–3 mm. longo, stigmate capitato. *Semina* in quoque loculo singularia albumine ruminato.

Eastern Himalaya. Abor Hills: Janakmukh and frequent elsewhere in high forest, 250–1000 m. Flowers in December and January. *Burkill* 37130.

963. **Ophiorhiza heterostyla,** *Dunn* [Rubiaceae-Hedyotideae] *O. oppositiflorae,* Hook. f. affinis, sed corollae tubo intus hirsuto distincta.

Herba perennis, basi lignosa, laxe ramosa, procumbens, praeter inflorescentiam glabra, 30–40 cm. alta. *Folia* lanceolata, sensim acuminata, basi acuta, 10–15 cm. longa, papyracea, petiolis 3–4 mm. longis, nervis intra marginem arcuatis 6–8-paribus. *Flores* in cymas puberulas terminales aggregati, albi apice rubri, sursum inclinati; pedicelli 3 mm. longi; bracteolae minutae. *Calyx* cum ovario 2·5 mm. longus, dentibus 1 mm. longis distantibus linearibus. *Corolla* tubulosa, extus glabra, tubo 8 mm. longo intra infra faucem annulo hirsuto ornato in forma longistyla basi paulo incrassato, dentibus 4–5 cm. longis revolutis. *Stamina* basi corollae affixa; antherae in annulum versus basin tubi collectae vel ultra faucem exserta. *Stylus* in forma brevistyla in tubo inclusus, in forma longistyla ultra faucem exsertus. *Fructus* ignotus.

Eastern Himalaya. Abor Hills: in the Lalik and Igar valleys; south face of Bapu; Rengging and Rotung, 800–1100 m., always in deep shade, flowering in February and March. *Burkill* 36116, 36616, 37334, 38158, 38171. Heterostylism occurs in other species of this genus. The ring of hairs assists the device and would not be expected to vary in the same species as does the length of stamens and style.

964. **Psychotria aborensis,** *Dunn* [Rubiaceae-Psychotrieae] *P. calocarpae,* Kurz affinis, sed foliis late ovati subtus in venis tomentosis distincta.

Frutex 2 m. altus. *Caules* albi, cavi, fragiles. *Folia* late ovata, apice basique breviter acuminata, 20–24 cm. longa, chartacea, supra glabra, subtus praecipue in nervis ut petioli stipulae pedunculi pedicelli calycesque breviter tomentosa, nervis 10–12-paribus in nervum intramarginalem pulchre anastomosantibus; petioli 3–5 cm. longi; stipulae spathulatae, caudatae, 1·5–2·0 cm. longae. *Paniculi* fructiferi terminales, subsessiles, 5–7 cm. longi. *Pedicelli* 1–2 mm. longi. *Calycis* dentes 1–2 mm. longi, lineares. *Bacca* ovoidea, 1 cm. longa, 7 mm. diametro; cocci dorso unicostati, latere ventrali concavi.

Eastern Himalaya. Outer Abor Hills: Rotung; on the hill side over the Dihong in dense shade, 450 m. Fruits in December and January. *Burkill* 37601.

965. **Agapetes marginata,** *Dunn* [Vacciniaceae-Thibaudieae] *A. grandiflorae,* Hook. f. affinis, sed calyce ovarioque setosis et foliis obovatis distincta.

Frutex epiphyticus. *Radix* tuberosa, fusiformis, 30 cm. longa,

18 cm. diametro. *Folia* obovata, breviter acuminata, versus basin attenuata, tandem rotundata, subsessilia, 20–24 cm. longa, 8–11 cm. lata, coriacea, glabra; nervi marginem appropinquantes 20–22-pares, nervo valido intramarginali conjuncti, omnibus cum reticulo ixsiccitate praecipue subtus prominentibus. *Flores* in racemis abbreviatis ex nodis ramorum vetustiorum ortis; rachis 2 cm. longa, bracteis parvis triangularibus; pedicelli 2·5–3 cm. longi ut ovaria calycesque setis glandulosis dense tecti, apice articulati. *Calycis* dentes 5, ex tubo brevissimo lineares, 1 cm. longi. *Corolla* tubulosa, medio paulo inflata, 4 cm. longa, extus in venis praecipue versus apicem setulosa, dentibus 5 obtusis 6 mm. longis. *Stamina* 10, corollae basi affixa, apice paulo exserta, antheris granulatis subsessilibus 3 mm. longis, apice longissime bitubulosis. *Ovarium* globosum, 2·5 mm. diametro.

Eastern Himalaya. Outer Abor Hills: in the oak forest above Upper Rengging Camp; 900–1700 m. Flowering in January. *Burkill* 36340.

966. **Agapetes nutans,** *Dunn* [Vacciniaceae-Thibaudieae] *A. linearifoliae*, C. B. Clarke affinis, sed foliis vix involutis pedunculisque 6–7 cm. longis distincta.

Frutex epiphyticus. *Radix* crassa. *Ramuli* graciles. *Folia* linearia, apice longe caudata, basi sensim acuta, subsessilia, margine paulo involuto, glabra, 12–15 cm. longa, chartacea. *Flores* apicibus corollae exceptis glabri, in racemis axillaribus abbreviatis longe pedunculatis, pedunculo nutante 6–7 cm. longo pilis brevibus crispis albis vestito; pedicelli 1·2 cm. longi; bracteae parvae lineares. *Calycis* dentes basi brevissime coaliti, anguste triangulares, 4 mm. longi. *Corolla* tubulosa 2·2 cm. longa, 3 mm. diametro, coccinea, 5-plicata, dentibus acutis 3 mm. longis apice viridibus. *Stamina* 10, basi corollae affixa; antherae in parte pollinifera granulatae, subsessiles, 6 mm. longae, apice longe bitubulosae, paulo exsertae. *Stylus* aequilongus. *Ovarium* globosum, 2·5 mm. diametro.

Eastern Himalaya. Outer Abor Hills: in high forest on a "razor edge" ridge between Serpo and Lalik; 1700 m. Flowers in January and February. *Burkill* 36347.

967. **Buddleia candida,** *Dunn* [Loganiaceae-Euloganieae] ab *B. macrostachya,* Benth. foliis rugosis primo albo-tomentosis recedit.

Frutex primo albo-tomentosus, ramulis tandem subglabris brunneis. *Folia* lanceolata, apice basique sensim acuminata, crenulata, rugosa, chartacea, 12–17 cm. longa, 3–5 cm. lata, utrinque primo albo-lanata, tandem superne subglabra; petioli 1·5 cm. longi. *Flores* sessiles, 1–5-ni, plerumque 3-ni in racemos vel paniculas terminales 10–12 cm. longas collecti; bracteae lanceolatae, 3 mm. longae, ut folia, calyces, corollaeque vestitae. *Calyx* tubulosus, 3 mm. longus, lobis 4 lanceolatis 1·5 mm. longis. *Corolla* violacea, 6 mm. longa, tubulosa, lobis 4 patentibus ovatis 1 mm. longis. *Antherae* sessiles, paulo infra faucem insertae. *Ovarium* lanceolatum, hirsutum, 2 mm. longum; stigma clavatum

subsessile. *Fructus* capsularis, oblongus, 6 mm. longus, tomentosus.

Eastern Himalaya. Outer Abor Hills: Sidi river mouth and opposite Yambung on the north side of the Dihong; as low bushes scattered in the sward. Flowers in January. *Burkill* 37631.

968. **Aeschynanthus Monetaria,** *Dunn* [Gesneraceae-Cyrtandreae] ab omnibus speciebus Indicis foliis disciformibus recedit.

Caulis repens, primo puberulus, mox glaber, pallide brunneus, 2 mm. diametro, ex nodis 1·5–2·5 cm. distantibus fibros radicales folia pedunculosque emittens. *Folia* opposita, nummularia, 1·1–1·2 cm. diametro, crassa, evenia, glabra, integra, petiolis 1–2 mm. longis. *Flores* axillares, solitarii; bracteae minimae; pedicelli ut sepala corollaeque pilis parvis albis articulatis sparse vestiti, 1–2 cm. longi. *Sepala* libera, lineari-lanceolata, 4 mm. longa, 1 mm. lata. *Corolla* splendide coccinea, 3–4 cm. longa, tubulosa, curvata, superne horizontalis, fauce 1 cm. lata; labium superum e lobis duobus apice rotundatis 4 mm. longis et 6 mm. latis constitutum; lobi laterales reflexi, 5 mm. longi, 3 mm. lati; lobus anticus patens, 4 mm. longus, 3 mm. latus. *Filamenta* 2 cm. longa, glabra, antheris 2 mm. longis. *Ovarium* 8 mm. altum, stipite 2 mm. longo suffultum; stylus 3 mm. longus. *Fructus* ignotus.

Eastern Himalaya. Outer Abor Hills: Janakmukh; abundantly all over the upper part of a tree on Bapu, at Rengging and at Rotung 300–800 m. Flowers in December. *Burkill* 36088, 37186.

969. **Rhinacanthus grandiflorus,** *Dunn* [Acanthaceae-Justicieae] a *R. calcarato*, Nees calyce campanulato et cymis densis sessilibus recedit.

Frutex glaber, ad 1 m. altus, e nodis inferioribus radicans, in parte herbacea cystolithis brevibus albis tectus. *Folia* ovata, apice basique subito acuminata, 13–17 cm. longa, 5–8 cm. lata, chartacea, nervis 8-paribus cum rete siccitate prominulis; petiolus 1·5–3 cm. longus. *Cymi* terminales, densi, sessiles; bracteolae parvae, triangulares, 1 mm. longae; pedicelli 3 mm. longi. *Flores* albi, magni, conspicui. *Calyx* campanulatus, 2–3 mm. longus, dentibus angustis tubum aequantibus. *Corolla* 5–7 cm. longa; tubus cylindricus, 1·5–2 mm. diametro; limbus 4-lobus, lobo superiore lineari caudato 1·5 cm. longo erecto, 3 inferioribus obtusis in labium 2 cm. longum et latum coalitis. *Stamina* 2, ex parte tubi superiore orta: antherae ex fauce breviter exsertae, apice basique muticae, loculis suprapositis, polline lineis opacis et vinculis nodulorum longitudinaliter notato. *Capsula* oblonga, 3 cm. longa, basi in stipitem solidum contracta. *Semina* 4 (2 saepe abortiva) disciformia, rugosa, 5 mm. diametro.

Eastern Himalaya. Outer Abor Hills: common in shade of Shingkeng and other woods at Janakmukh and Ramidambang. Flowers in December. *Burkill* 37117, 36409.

970. **Gomphostemma aborensis,** *Dunn* [Labiatae-Prasieae] a *G. microcalyce*, Prain foliis late ovatis distincta.

Herba decumbens, praeter corollas breviter tomentosa. *Caulis* obtuse quadrangularis, in parte prostrata radicans. *Folia* late ovata, apice obtusa, basi subito acuminata, 5–8 cm. longa, crenato-serrata, subtus reticulata; petioli 2–3 cm. longi. *Flores* 4–8-ni, in verticillis axillaribus sessiles. *Calyx* anguste campanulata, 1 cm. longa; dentes tubum aequantes, anguste triangulares. *Corolla* luteola, 2·5 cm. longa, intus et extus pubescens; limbus tubo 1 mm. lato 4-plo brevior; labium superius erectum, anguste ovatum; labium inferius patens, tri-lobatum. *Stamina* superiora sub fauce inserta, inferiora paulo infra orta, antheris omnibus parallelis e fauce breviter exsertis. *Ovarium* 4-partitum; stylus stamina paulo excedens. *Nucula* 1, carnosa.

Eastern Himalaya. Outer Abor Hills: Janakmukh; very common, and at the mouth of the Yamne near Pongging. Flowers in December. *Burkill* 37269.

XXII.—MISCELLANEOUS NOTES.

Mr. G. G. Auchinleck, B.Sc., Assistant Director of the Department of Agriculture, Mauritius (*K.B.*, 1914, 227), and Capt. Norman Marshall have been appointed by the Secretary of State for the Colonies, the latter on the recommendation of Kew, Divisional Agricultural Officers in the Department of Agriculture, Ceylon.

Messrs. F. W. Hall and G. T. Philpott, members of the gardening staff of the Royal Botanic Gardens, Kew, have been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant District Agricultural Officers in the Department of Agriculture, Uganda.

William James Tutcher.—The news of the sudden death of Mr. Tutcher in Hongkong will be received with great regret by his many friends in England. His loss to the English community in the little Crown Colony in which he had lived for nearly thirty years will be keenly felt, and the Chinese staff of his department will also mourn one who always understood and cared for them. The example of unwearying attention to duties and his enthusiasm for botanical and horticultural enterprise in the colony was a splendid training for his subordinates. During the three decades of his work he has built up a lasting memorial in the affection of his Chinese and English friends as well as in the various gardens and ornamental spaces that he did so much to establish and to keep in fine orderly condition for the public of Hongkong. One of the works which fell to his lot was the laying out of the golf course at Fanling ,which has grown into one of the most beautiful places of recreation in the colony, thanks largely to his skill and perseverance.

William James Tutcher was born near Bristol in 1867, and educated at the Merchant Venturers School in that city. With

the technical scientific training there received, and after five years' experience in good private gardens, he came to the Royal Botanical Gardens, Kew, in 1888, as a "young gardener." His progress here was so satisfactory that two years later he was promoted to the post of sub-foreman, and placed in charge of the orchid department. In 1891 as an accomplished and reliable young man, he was recommended to the Secretary of State for the Colonies as Assistant Superintendent to Mr. Ford in Hongkong. Before leaving England he had married Miss Elizabeth Aikman, sister of Mr. John Aikman, then and still assistant in the Director's Office at Kew, thus further cementing an association which he was destined to maintain as long as he lived to the mutual advantage of his new department and the one he was leaving.

Mr. and Mrs. Tutcher were very happy in Hongkong and very busy. His free days were nearly always spent in botanical exploration of the island, and for many years he might be seen on almost any fine holiday tramping off to Mt. Parker, from whose gulleys and ravines he usually returned about nightfall and emptied out on the herbarium table his miscellaneous spoils. A glance at the list of additions to the Hongkong flora during his time gives some idea of the success of his outings.

In 1915, he published as a supplement to his report an account of an expedition to an area on the N. River, which had not been previously visited by a botanist. To do this he took advantage of four consecutive holidays and returned with examples of five new species as well as of a great many additions to the provincial flora.

In 1904, he became a Fellow of the Linnean Society, and attended the meetings at Burlington House on the rare occasions when he was on leave. In 1910 he became Superintendent of the Botanical and Forestry Department. In 1912 he published with his predecessor, Mr. S. T. Dunn, the Flora of Kwangtung and Hongkong as vol. X. of the Additional Series of this periodical, to which he contributed the description of the Orchidaceae (of which he had a special knowledge), as well as of most of the Monocotyledons. He had previously published a small work on Gardening in Hongkong. No one knew better than he the difficulties of the climate, and how they could be overcome, and his publication was greatly appreciated in Hongkong and neighbouring parts of China.

The herbarium of his department contains, of course, the great bulk of Mr. Tutcher's botanical specimens, but several hundreds of them may be seen in the Kew Herbarium, and in that at Manila (P.I.).

The genus *Tutcheria* was founded by Mr. Dunn on a tree in the Hongkong Botanical Gardens which had been supposed to be *Camellia reticulata*, Lindl., until Mr. Tutcher pointed out its distinctive characters (cf Journ. Bot. xlvi. 324). Many new species discovered by Mr. Tutcher were at different times called after him. He himself published many novelties, including a new genus (*Dunnia*, Tutcher, *Rubiaceae*, Journ. Linn. Soc. xxxvii. 69) *Quercus Elizabethae*, Tutcher, called after his wife

(cf. Journ. Bot. xlix. 273). Besides these articles Tutcher published the annual reports of the department during his term as Superintendent, as well as on various occasions when he was acting in that capacity. All these reports contain items of great botanical and economic interest, besides the records of the horticultural and forestry work of the colony. S. T. D.

Aloe Specimens from Pretoria.—A valuable collection of Aloe specimens—eventually to be representative of the whole of Southern Africa—is being amassed at Pretoria, where the plants thrive in a naturally rugged setting round the Union Buildings. Of these Dr. I. B. Pole-Evans has recently forwarded a fine set of 56 named herbarium specimens, of which no less than 22 are new to Kew. These, retaining to a remarkable degree their colouring and bloom, form a marked contrast to the majority of dried succulents, and should prove an invaluable addition to our shelves.

South African Aloes*.—Dr. Pole-Evans contributes a paper on the genus Aloe in South Africa, no less than 110 species being recorded. Of these as many as 60 species are in cultivation at Kew at the present time. (*See below.*) The paper lays stress upon the fact that certain Aloes of reputed South African origin, which have for centuries been under cultivation in Europe, are at present unknown in South Africa; others, however, have in recent years been re-discovered in the land of their origin. *A. succotrina*, Lam., comes under the latter category, for although it is the first South African Aloe known to be cultivated in Europe, being figured and described in *Horti Medici Amstelodamensis* as early as 1697, its actual home on the slopes of Table Mountain remained unrecorded until about fourteen years ago. Interest in members of the genus has been sustained and lucid notes are given on the parts played by Miller, Linnaeus, William Aiton, Haworth, Bowie, Salm-Dyck, Thomas Cooper, J. G. Baker, Schonland, Marloth and others, while tribute is paid to the valuable monograph on the subject by Alwin Berger. A taste for the cultivation of Aloe rockeries has of late been created in South Africa and this should be fostered by the practical advice afforded by the paper, while it is evident that Dr. Pole-Evans foresees that results valuable to science may accrue from the co-operation of an interested public.

List of aloes mentioned in "Our Aloes," by Dr. Pole-Evans, cultivated at the Royal Botanic Gardens, Kew.

Aloe aculeata, Pole-Evans.
A. africana, Mill.
A. albispina, Haw.
A. arborescens, Mill.
A. aristata, Haw.
A. Bainesii, Dyer.

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* Our Aloes, by I. B. Pole-Evans, M.A., D.Sc., F.L.S., Journ. Bot. Soc. S. Afr. Pt. V. pp. 11–16 (1919).

A. Brownii, Baker.
A. caesia, Salm-Dyck.
A. candelabrum, Berger.
A. castanea, Schonl.
A. chloroleuca, Baker.
A. ciliaris, Haw.
A. commixta, Berger.
A. Cooperi, Baker.
A. Davyana, Schonl.
A. drepanophylla, Baker.
A. Dyeri, Schonl.
A. ferox, Mill.
A. glauca, Mill.
A. globuligemma, Pole-Evans.
A. grandidentata, Salm-Dyck.
A. Greatheadii, Schonl.
A. Greenii, Baker.
A. latifolia, Haw.
A. leptophylla, N.E.Br.
A. lineata, Haw.
A. longibracteata, Pole-Evans.
A. longiflora, Baker.
A. macracantha, Baker.
A. Marlothii, Berger.
A. mitriformis, Mill.
A. nitens, Baker.
A. nobilis, Haw.
A. obscura, Mill.
A. parvibracteata, Schonl.
A. Pearsonii, Schonl.
A. Peglerae, Schonl.
A. petricola, Pole-Evans.
A. Pienaarii, Pole-Evans.
A. platylepis, Baker.
A. plicatilis, Mill.
A. pluridens, Haw.
A. purpurascens, Haw.
A. rubro-lutea, Schinz.
A. Salm-Dyckiana, Schultes
A. saponaria, Haw.
A. sessiliflora, Pole-Evans.
A. Simii, Pole-Evans.
A. speciosa, Baker.
A. spicata, L.
A. striata, Haw.
A. striatula, Haw.
A. succotrina, Lam.
A. suprafoliata, Pole-Evans.
A. supralaevis, Haw.
A. tenuior, Haw.
A. Thraskii, Baker.
A. variegata, L.
A. virens, Haw.
A. Wickensii, Pole-Evans.

Flora of Uitenhage and Port Elizabeth.*—The Committee of the Botanical Survey of the Union of South Africa (see *Kew Bull.* 1920, p. 402), realising the importance of the linking of stages of progress by a periodical summing-up of data in the form of check-lists and local and regional flora-records, made provision for the occasional publication of "Memoirs of the Survey," No. 1 of which, entitled the "Phanerogamic Flora of the Divisions of Uitenhage and Port Elizabeth," has now appeared. The Survey is to be congratulated upon the publication of a paper which is so comprehensive in its treatment and which, at the same time, reveals the incompleteness of the present state of exploration. Dr. Schonland reports that large areas of the northern and north-western portions of the division of Uitenhage are, from a botanical point of view, very little known: this statement alone may be regarded as a promise for the botanical conquest of such regions, and it stands as a challenge to those who have the opportunity to contribute towards such an achievement.

The region under discussion reaches from the Sundays to the Gamtoos River, and from the Indian Ocean about fifty miles in-

* Botanical Survey of South Africa, Memoir No. 1. Phanerogamic Flora of the divisions of Uitenhage and Port Elizabeth, by S. Schonland. To be obtained from the Librarian, Agricultural Department, Union Buildings, Pretoria. Price 2s. 6d.

land, thus including the Klein Winterhoek Mountains and the Zuurberg Range. It is an area which constitutes an important phytogeographical boundary between the "Eastern" and the "South-Western" Regions, and this point is ably discussed in the paper. In this connection mention may be made of the practical way in which the plant list itself indicates the relation of the flora with that of the Cape Peninsula and Natal respectively, distinguishing signs being attached to species which the area holds in common with one or other of the regions to which it stands as a buffer. Interesting details regarding the topography and geology of the Divisions are followed by careful climatic analyses which emphasise such points as: the effect of winds upon the dispersal of western types; temperature contrasts; the approximate balance of winter and summer rains; the parts played by mists and by drought and the need for irrigation in the Uitenhage division.

A region, merging from a low coastal belt to an altitude of nearly 5000 ft. and traversed as it is by such a series of minor mountain ranges with alternating plateaux, may be expected to offer ample scope for the study of ecological problems, and Dr. Schonland touches upon the various types of plant-life represented by his list. There is the vegetation of the *sand-dunes*, and of the *halophilous meadows* (notably the "fields by the Zwartkops River" mentioned by Ecklon and Zeyher), a record of the rare plants of the latter being given: on the Van Staden Mountain *south-western hill vegetation* predominates, while the Coastal Plateau shows an interesting mingling of *south-eastern and south-western types*. Then *Karroid Succulents* are seen to prevail in the north-western parts, while mingled with these is the Thorn Scrub, itself preponderating in the Addo Bush where it still forms a shelter for herds of elephants. Pure *Grassland formation* is found on the Zuurberg, on the "Grass Ridge" east of Uitenhage and east of the Sundays River near its mouth. Pure *Acacia formation* and *Forest Patches* also occur, in addition to which record is made of water and swamp plants and of phanerogamic epiphytes and parasites.

The records are based on the specimens in the herbarium of the Albany Museum, collected mainly by Drège, Ecklon and Zeyher, H. Bolus, MacOwan, Schlechter, Mrs. T. V. Paterson, Rogers, F. H. Holland and Kemsley.

Systematic Elements of the Flora.

—	Orders.	Genera.	Species.	Non-native species.
Gymnosperms	3	3	7	—
Monocotyledons ...	22	203	637	about 23
Dicotyledons	104	510	1,668	„ 81
Totals	129	716	2,312	„ 104

Proportion of genera to species, 1 : 3·2.
„ Monocotyledons to Dicotyledons, 1 : 2·6.

The Flora which consists of 118 pages and a sketch map of the region includes a covering letter from Dr. I. B. Pole-Evans, Director of the Botanical Survey of South Africa, to the Secretary for Agriculture and a commendatory Preface by Mr. F. B. Smith, Secretary for Agriculture.

The publication of so useful a memoir by the Government of the Union of South Africa affords welcome evidence of the enlightened view held by that Government of the value of science and also indicates that they realise fully the need of acquiring an intimate knowledge of the resources of the country by the development and proper application of scientific method.

Attention may be called to the only error we have noticed; *Aizoaceae* on p. 52 should be placed above the genus *Limeum*.

Carex riparia, var. **gracilis, in Britain.**—In July, 1914, Mr. E. Thurston, C.I.E., who lately presented his fine herbarium of Cornish plants to Kew (see *K.B.*, 1920, p. 44), collected an interesting sedge in the Gunwalloe Valley, Cornwall. After careful investigation it has been concluded that the earliest name applicable to this plant is *Carex riparia*, Curt. var. *β gracilis*, Coss. et Germ., Flore de Paris, 1845, p. 605, where the following description is given: "Tiges presque lisses sur les angles. Feuilles souvent vertes. Épis mâles solitaires ou géminés. Épis femelles laxiflores, longuement pédonculés, souvent pendants. Utricles longuement dépassés par les écailles. Ecailles très longuement cuspidées-aristées.—A. R.—Endroits marécageux ombragés.—Corbeil! Mennecy! La cour de France! etc."

The variety is kept up by Husnot, "Cypéracées de France," p. 54 (1905–06), but Rouy et Foucaud, Fl. de France, vol. 13, p. 486 (1912) make it a synonym of var. *gracilescens*, Hartm., ap. Anderss., sub-var. *aristata*, Rouy et Fouc. *Carex riparia*, var. *gracilescens*, Hartm., has been considered by some authors the hybrid *C. riparia* × *vescicaria* (see J. G. Laurell in Allg. Bot. Zeitschr. 1900, p. 197). The Cornish plant does not suggest a hybrid nature. Kükenthal (in Engler, Pflanzenr., iv. 20, p. 73) apparently considers the var. *gracilescens*, Hartm. a mixture and, not having seen the still earlier description and name of *gracilis*, Cosson et Germain, he makes the new combination var. *subgracilescens* for what is apparently the same variety.

In the Kew Herbarium a specimen from the Isle of Wight, collected by Dr. Bromfield in a wet salt marsh, at the mouth of the Wootton creek between Ryde and Cowes, in May, 1846, has long peduncles to the female spikes and acuminate glumes longer than the utricles, and must be referred to the var. *gracilis*, Coss. et Germ. It is somewhat abnormal in having androgynous spikes.

Lastly, a plant referred to in the Report for 1915 of the Botanical Society and Exchange Club, p. 379, is the same variety. The following information is there given: "*Carex riparia*, Curt. forma. Tickenham Moor, N. Somerset, v.– c. 6, June 5, 1915. Growing in an open rhine, free from shade."—Miss Ida M. Roper. "Remarkable for its very long lower peduncles and female glumes."—E. S. Marshall. "A curious and interesting

form of *riparia*, exactly analogous to *C. vesicaria*, L., var. *pendula*, Uechtr. Herb. Cf. Asch. & Graeb. in Syn. Mitt. Fl. 212, 190. It may be called f. *pendula*.—A. Bennett." A specimen of this plant has been seen in the private herbarium of Mr. Bruce Jackson, A.L.S. W. B. T.

Forests, Woods and Trees.*—Professor Henry's book appears most opportunely. The depletion of British forests consequent on the demands for timber during the war has created an interest in the subject of forestry more genuine and widespread than has ever existed before. The major part of this book is given up to the consideration of the afforestation of the great water catchment areas of the United Kingdom, owned or controlled by municipalities, and aggregating at the present time nearly one million acres. Although the main purpose of the book is tree-planting regarded from its hygienic aspect, the possibilities of afforestation on so large an area as this is very important from the purely economic standpoint. Existing conditions in regard to ownership of land and timber production in this country make it unlikely that private enterprise alone will do much towards improving the general situation. It is fortunate, therefore, that over one-fifth of the total area of these catchment grounds is owned by public authorities, and encouraging to know that such large Corporations as those of Liverpool, Manchester, Leeds and Birmingham have already found the result of their afforestation schemes to be satisfactory. This subject, although the predominant one in Professor Henry's book, is far from being the only one. The question of the influence of forests on climate is fully discussed, and from the statistics given it would appear that their effects on rainfall are not so great as is generally supposed. Especially is this the case with forests occurring at altitudes of less than 300 ft. With regard to temperature their influence is to reduce the summer heat in the day-time and to keep it higher at night. "Spring and autumn frosts are much less frequent and less disastrous in wooded tracts than in open country." Other chapters deal with the sanitary influence of forests and their value as sites for sanatoria.

A matter of great interest and importance to urban and suburban dwellers is that of trees in parks and in streets. There is a singular lack of enterprise among municipal authorities in regard to this question. An ineradicable conservatism as a rule prevents them from planting any but the most ordinary things, in consequence of which the normal municipal park is extraordinarily dull and commonplace. With such a marvellous choice of beautiful trees and shrubs as is available in these days this ought not to be. But in how many places, for instance, can one find a good collection of magnolias, the most gorgeous flowering trees of northern temperate regions, or of the finest cherries, crabs and such like? The same reluctance to experiment or depart from an ancient order of things is seen also in street planting. The two great defects in the planting of streets as practised nowadays are

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* Forests, Woods and Trees in Relation to Hygiene. By Augustine Henry, M.A., F.L.S., M R.I.A. Constable & Co., London, 1919. Price 18s. net.

that the trees selected are naturally too large and too spreading in habit, thus necessitating a ghastly system of pruning; also that they are too thickly planted. Professor Henry recommends a space of 40 ft. between each tree in the lines up each side of the street. This is little enough, but oftener than not street trees are not allotted so much. There are few things more dismal than an over-planted suburban street during a wet spell in late summer or early autumn, the paths transformed into cold damp tunnels of foliage. It is to be hoped that Professor Henry's valuable chapters on these subjects will be read and studied by all those concerned. The book, in fact, is one that has a special claim to the notice of all municipal officials who control the planting of streets, parks and watersheds. W. J. B.

French Forests and Forestry.*—This work is from the pen of Mr. Theodore S. Woolsey, Jr., lately of the United States Forest Service, and is descriptive of forests and forest conditions existing in the French Colonies, Tunisia, Algeria and Corsica. Each colony is treated separately and details are given of the general economic and social conditions prevailing in the different countries, and the steps that have been taken to secure a system of forest management beneficial to the country and acceptable to the inhabitants. In the early days following the inauguration of a system of forest management which placed considerable restrictions upon the freedom of the people, particularly in the observance of regulations governing the pasturage of cattle, trespass, camping, avoidance of fires, and unlawful removal of timber, friction arose between the French forestry officials and the natives through the French copying too closely the methods of administration prevailing in France. By 1904 the difficulties of management had become so great that Governor Jonnart assembled a commission to study the cause of the dissatisfaction amongst the natives and to prescribe remedies. In his opening address he made use of certain words which appear worthy of consideration, not only in so far as they apply to pioneers in French colonies, but also to other parts of the world. After eulogistic references to the forest officers and their services, he said, "I give them willingly the praise, but I blame them for keeping a little too much apart from the other Algerian service, for applying the regulations too uniformly, and for not having developed the flexibility and the means of adaptation so indispensable to an administrative organization, in a colony where it is unpolitic and often dangerous to try to follow at all times in the footsteps of the fatherland. . . . My desire is that a permanent 'entente cordiale' be established between the Forest Service and the prefects, assistant prefects, and administrators of mixed communes, so that they may work together for the special needs of the popula-

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* French Forests and Forestry. Tunisia, Algeria, Corsica. With a Translation of the Algerian Forest Code of 1903. By Theodore S. Woolsey, Jr., M.F., Assistant District Forester, U.S. Forest Service, 1908-1915, Lecturer, 1912, 1916-17, Yale Forest School. New York, John Wiley & Sons, Inc.; London: Chapman & Hall, Limited. 1917.

tion, the preventive measures to be adopted in view of conflagrations, and the fight against the floods. I wish, moreover, that formalities and administrative red tape should not complicate things, as if for the sake of mere convention. I wish finally that the Forest Service should never lose sight of the fact that the surest way to avoid fires is still to interest the natives in the existence of the forests, and to associate them in their conservation, either by showing a greater leniency, so far as the pasturage of their flocks is concerned, or by granting them small individual felling areas. I could cite regions where the natives confined between the lands opened for settlement cannot move, one might say, without risking lawsuits." The deliberations of the commission resulted in several administrative changes which did much to remove vexatious regulations and to reconcile the natives to a curtailment of what they had hitherto regarded as their natural rights. At the same time an educational system was established, whereby they were convinced of the necessity of good methods of forest management for the preservation of the country. The climatic conditions prevailing over a good deal of Tunisia and Algeria are distinctly adverse to the establishment of forests, and the accepted methods of procedure in continental countries have undergone considerable modification in their application to these colonies. Long periods of bright sun, with, in some districts, hot drying winds, prevail, whilst in the wet season there may be torrential storms. The methods adopted by French foresters to overcome the peculiarly trying conditions are worthy of close consideration by planters in other parts of Africa. The most useful economic tree of Tunisia is the Cork Oak (*Quercus Suber*), followed by *Q. Mirbeckii*, and *Pinus halepensis*. The same trees are prominent in Algeria with *Cedrus atlantica* and a few others. In Corsica, *Pinus Laricio*, *P. Pinaster*, *Quercus Ilex*, *Q. Suber*, *Fagus sylvatica*, and *Castanea sativa* are amongst the commonest trees. The metric system of measurement is followed in the book with the equivalent in feet, etc., and here and there errors occur: thus on p. 43 the height of Indian corn is said to be 1·5 metres (7 yards), and on p. 47 the height of Mount Traras is given as 11,359 metres (3727 ft.). W. D.

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ROYAL BOTANIC GARDENS, KEW.

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XXIII.—A REVISION OF ISOPYRUM (RANUNCULACEAE) AND ITS NEARER ALLIES.

J. R. Drummond and J. Hutchinson.

The genus *Isopyrum* was established by the elder Linné in 1742 (Genera Plantarum, ed. II. p. 245). The generic description may be rendered into English as follows:—

"*Calyx* none. *Petals* five, ovate, equal, spreading, deciduous. *Nectaries* five, equal, tubular, very short, placed within the corolla: the mouth of each oblique, undivided. *Stamens* indefinite, shorter than the corolla; filaments capillary; anthers simple. *Ovaries* two, ovate; styles simple, as long as the ovary; stigmas obtuse, as long as the stamens. *Fruit* a pair of recurved unilocular, crescent-shaped pods; seeds very many."

A note is added: "Hence neither of the genus Aquilegia nor of Helleborus, much less of Thalictrum.

The above generic description does not fit the actual characters of any of the three species which its author subsequently assigned to his new genus (Species Plantarum, ed. 1753, vol. i. p. 557); and it appears to have been based on the accounts embodied in the works cited, and particularly on Boccone's illustration of *Isopyrum thalictroides* in which the "two legumes" are inaccurately figured.

The character "seeds very many" obviously belongs to *Isopyrum fumarioides*, described in Hortus Upsaliensis in 1747 (p. 157), and the only species represented in the Linnean Herbarium; and this is probably the only one seen by Linnaeus.

Early in 1753 Haller published a criticism of "*Isopyrum fumarioides*, Linn. Upsal. p. 157" in his *Enumeratio Horti et Agri Gottingenensis*, p. 97, remarking that it "belongs, just as Trollius does, to Helleborus":—but he omitted to point out the discrepancy which the Linnean description involved by its combining the "two legumes" of Boccone's plant with the "many seeded" capsules of Amman's description in a single generic character, the "legumes" in the European plant being at most

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three-seeded, while the "polyspermous" follicles of the Siberian weed are usually more than half a score.

Possibly on account of Haller's remark Linnaeus placed his "polyspermous" *Isopyrum fumarioides* in the front rank (in the first edition of the Species Plantarum):—in the next following (fifth) edition of the Genera (No. 621, p. 244), he revised the description of the "Pericarp" as follows, "Capsulae plures lunulatae recurvae uniloculares," though the follicles in *I. fumarioides* are neither definitely "recurved" nor "crescent-shaped"; the "observation" was at the same time modified to "most akin to Helleborus, but very different in habit."

In the sixth (1767) edition of the Genera (p. 282, No. 701) the misleading "semina plurima" reappeared, but Haller again failed to recognise its significance, though, having meantime received specimens of *I. thalictroides* from Jacquin, he noted (1768) in the Historia (ii. 58) that the Austrian plant appeared to differ from the Siberian in character, and recorded certain marks in the European species which certainly support his view.

This state of matters was due to the efforts to identify the original samples of Dioscorides, a task which, as Sprengel points out (Dioscorides ii. 626), was particularly hard in the case of Isopyron—"erutu difficillimum est." Sprengel hazards *Corydalis claviculata*, Persoon—an identification which, as he says, is at least no worse than "Dodoens' hallucination" in favour of the Bogbean (*Menyanthes*). Cesalpini guessed *Lathyrus;* while Fabio Colonna opens his *Phytobasanos* (1592) with an argument supported by a really fine illustration to show that Dioscorides' "flame-like" plant was the familiar Columbine; but, supposing that he was right, Linné was none the less justified in appropriating the name for his new genus, if only as a partial safeguard against Mattioli's device (Comment. p. 328 and 493, ic. 4), who tacked root-leaves of Anise to the stem and flower of a *Nigella*, with the plea that Dioscorides had employed these for comparison with the corresponding parts in *Isopyron*. Colonna's arguments failed to convince Sprengel:—but *Isopyrum*, once it was fixed by Linnaeus in his binomial system, automatically retained its attachment.

Unfortunately it was not furnished with an adequate or certain connotation. In Species Plantarum ed. i. (1753) p. 557, three species are discriminated, the first being *I. fumarioides*, and the second *I. thalictroides*, the latter founded on the *Ranunculus praecox ii thalictrifolio* discovered by Charles de l'Escluse in glades near Vienna and described in the Historia at p. 233 (1601). The history of Linné's third species *I. aquilegioides* is contained in a tract published at Basle in 1776 by Werner de Lachenal, who had traced in the Bauhin Collection the actual specimen which formed the type of *Aquilegia montana flore parvo thalictrifolio* C. B. Prodr. p. 75, as well as a figure of the same, of which he annexed a good engraving to his Dissertation. It proved to be *Aquilegia viscosa*, Gouan. The citation from Bauhin is of course the sole basis of Linné's third supposed *Isopyrum;* Ray simply cited that without comment, and the subsequent confusion rests on Morison, who abbreviated Bauhin's text

and misapplied it to a very poor drawing of a supposed *Aquilegia* borrowed, without acknowledgment, from tab. 8 in the *Pugillus* of Christian Mentzel (Berlin 1682), which could not possibly have been meant for an *Isopyrum*.

In the Systema ed. XII. ii. 372 (1768), Linné repeats the statement as to the number of the seeds in *Isopyrum;* in the second Mantissa (1771) p. 408 he observed that in *Isopyrum thalictroides* there are only three "germens," citing Scopoli, *Flora Carniolica*, ed. i. p. 555 (1760); he omitted, however, Scopoli's further observation that the carpels are one-seeded. Murray and Willdenow, accordingly, in turn reproduced the erroneous definition as regards the number of the ovules. Crantz (*Stirp. Austr.* fasc. ii. p. 125, ed. 1763) criticised Linné's account of *Isopyrum*, with reference, more especially, to the description of the petals ("nectaries"). Gaertner (1788) treated *I. fumarioides* as the type of *Isopyrum* (De Fructibus i. 312 tab. 65 f. 5); and this view has found support from Torrey and Gray (Flora of North America i. Suppl. 660).

It was not until 1839 that a satisfactory definition of *Isopyrum* as a genus* was framed, and this was only attained by separating *I. fumarioides*, on which Spach (Suites à Buffon VII. 326–7) following a note by Reichenbach in the Flora Germanica Excursoria (1832) p. 747, founded the new genus *Leptopyrum*, and it seems preferable to regard the genus *Isopyrum* as subsisting on the authority of Spach following Reichenbach. This constitutes *I. thalictroides*, Linn. Sp. Pl. i. 557 (1753) the type of *Isopyrum*, and excludes such allied forms as do not exhibit the characters of that genus as amended in the *Histoire Naturelle des Vegetaux* (Paris 1839) vii. p. 326.

Bentham and Hooker in *Genera Plantarum* vol. i. p. 8 (1862) amended the description of the genus with respect to the number of the ovules. They estimated the content of *Isopyrum* at seven species, and in the Index Kewensis to date there are thirty-two valid specific names.

The first addition to the Linnean species of *Isopyrum* was published by Alphonse de Candolle in the *Systema*, i. p. 324 (1818), as *I. adoxoides*, based on Plukenet's figure 3. t. 360 Amaltheum, page 19 of text (1705), a species found in the island of Chusan by James Cuninghame. Cuninghame's collections are preserved in the Sloane Herbarium, at the Natural History Museum. Plukenet's type is on p. 151 of vol. xciv.; duplicates on pages 83 and 100 of vol. xx.; all three correspond quite clearly to the Amaltheum illustration and De Candolle's description.

This species has a varying number of the inner row of stamens converted into scales or staminodes, a condition which is characteristic of the genus *Aquilegia*, but has not been observed in

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* Previously in *Conspectus Regni Vegetabilis*, No. 4954 (Leipzig 1828) but without note or description:—also *Icones Florae Germanicae* iii. 26 t. cxiii. fig. 4728 & 4728 (b), publ. 1840. In the *Dictionnaire Classique* vol. ix. p. 34 (1826) A. Richard had originally pointed out the propriety of dividing the Linnean genus, but he assigned *Isopyrum* to *I. fumarioides*, and proposed a new genus, *Thalictrella*, for *I. thalictroides*:—in 1830 (vol. xvi. p. 204) he cancelled *Thalictrella*.

Leptopyrum, nor in any of the other species placed by the earlier botanists under *Isopyrum*, and has accordingly been made the type of a separate genus, *Semiaquilegia*, by Makino, Bot. Mag. Tokyo xxi. (1902) p. 119.

In addition to the three species described by De Candolle under *Isopyrum*, the *Systema* includes at p. 337 a species named by Willdenow (Mag. Gesellsch. Naturf. Freund. Berlin, 1811, p. 401. t. 9 f. 6), *Aquilegia anemonoides*. The early history of this graceful plant is somewhat obscure; in the *Flora Altaica* (1830) Ledebour mentions Gebler as the collector, but in the *Flora Rossica* (1842) vol. i. 53 this is corrected, and priority given to the elder Schangin.* with a Latin version of Schangin's appreciation of the "beautiful dwarf Columbine," which his Journals (in Pallas, Nordische Beitrage vi. 55 publ. 1793) show him to have discovered on "inaccessible" ledges at the head-waters of the Korgon, an affluent of the Irtish in the Western Altai.

The same species is stated by Ledebour (Flora Ross. i. 53) to have been in Stephan's herbarium, named in manuscript as "Aquilegia minuta." It was communicated by Fischer probably to Willdenow, who referred it to *Aquilegia*. Fischer, however, placed the species in *Isopyrum*, and it was published (1824) in the Prodromus i. 48 as *Isopyrum grandiflorum*, Fisch. in litt., although on p. 51 of the same work he included "Aquilegia anemonoides" on the authority of Willdenow. A note by Bentham in his interleaved copy of the Prodromus, now at Kew, shows that in 1828† Arnott elicited from Fischer that his *Isopyrum grandiflorum* and Willdenow's "Aquilegia anemonoides" were one and the same thing. Accordingly in the *Flora Altaica* (Berlin 1830) vol. ii. p. 299, Ledebour included *I. grandiflorum*.

De Candolle, following A. L. de Jussieu, Gen. Plant. (1789) p. 233, improved the definition of the genus *Isopyrum*, treating in the *Systema* (i. 323) the "nectaries" as petals, and the "petals" of the older botanists as sepals, and providing a sufficient line of division as against *Helleborus* in the deciduous sepals of *Isopyrum*.

Prain‡ has demonstrated, for the *Papaveraceae*, the difficulties that beset any attempt to limit the genera in these Thalamifloral families on a practical basis, and this applies with at least equal force to the *Ranunculaceae*. To take an example, no phyletic theory could stand which fails to account for the obvious parallels in general morphology of certain species linked with *Isopyrum thalictroides* and the genus *Thalictrum*, but at the same time it is impracticable to frame any arrangement of the family, as a

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* Peter Ivanovich Schangin, an officer of the Department of Mines; eminently skilled in the geology and especially petrology of the time; a keen student of natural history, and a good botanist; in 1786 he conducted an exploration of the Altai Mts. primarily in search of lapis lazuli quarries; his report includes a masterly account of the geography and mineralogy of the upper Irtish basin, with full and highly interesting notes on the Flora.

† Attention had probably been aroused by the appearance of Sprengel's *Systema* vol. ii. (1825), which included both 'Isopyrum grandiflorum, Fisch.-Cand.', and 'Aquilegia anemonoides, W.'

‡ Noviciae Indicae, pp. 105–129.

whole, without recognising the importance that attaches to the follicular, as opposed to the achenial character of the mature carpel. Now in *Isopyrum grandiflorum* and its closer allies, the mature follicles are manifestly more akin in structure and development to those of *Aquilegia* than to *Isopyrum thalictroides*, or—to take another example of the same series—to *Isopyrum adiantifolium*, and after weighing all the conditions we have found ourselves obliged to propose a fresh* genus for these Central Asian perennials (*i.e.*, for the *grandiflorum group*), to which we have given the name of *Paraquilegia*.

In the Prodromus (i. p. 48) De Candolle admitted though not without question the genus *Enemion*, founded on a species—not unlike the Wood Anemone of Europe,—which is plentiful in woods in the United States of America. The first scientific observer of this plant, often associated with *Syndesmon thalictroides*, Hoffmans., and gathered with it, was Dr. Short, of Lexington, Kentucky, who in 1820 sent to Sir William Hooker specimens now in the Kew Herbarium, contending that these were identical with *Isopyrum thalictroides*, Linn., of Europe, of which Hooker at first thought it might prove to be an apetalous form. Relying mainly on the absence of petals Rafinesque, in *Journal de Physique* (De Blainville) Tom. xci. pt. 2, p. 70 (1821) constituted *Enemion*. In Hook. Journ. Bot. i. 187 (1834) a brief notice of Short's specimens was intercalated in a summary of Thomas Drummond's Louisiana collections without formal description; in 1840 (Bot. Beech. Voy. Suppl. 326) a second apetalous species, discovered by Douglas about 1830 in California, was described by Hooker and Arnott as *Isopyrum occidentale*. In the same year in their *Flora of North America* (vol. i. Suppl. 160) Torrey and Gray, while accepting Hooker's reduction of *Enemion*, established the independence as a species of *Isopyrum biternatum* (*Enemion biternatum*, Rafinesque) as against Short's theory of its being merely a "geographical form" of the European *I. thalictroides*. Three species of the same type as *I. occidentale* have since been discovered, two American and one from North-East Asia, all from the North Pacific region. *Enemion*, therefore, must be held to have justified its author's discrimination. It is a fairly "natural" genus, in the accepted sense, more so than *Semiaquilegia*, where there is conspicuous diversity of habit between Makino's type and certain of the species which we have been led to include along with it, as they also exhibit the essential character—the conversion into scales of some of the inner stamens. *Semiaquilegia adoxoides* approaches *Paraquilegia* in general appearance and has moreover very few staminodes, whilst *S. simulatrix*, on the other hand, is in general appearance so absolutely a Columbine that it was described by Maximowicz, Fl. Tangut. (1889) p. 20, t. 8, f. 12, as *Aquilegia ecalcarata*, but apart from the staminodes, the petal-spur† characteristic of *Aquilegia*

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* cf. Spach, Suites (as above) p. 327.

† One modern view regards the so-called 'petals' of these *Helleboreae* as "highly modified staminodes"; cf. Prantl. in Pflanzenfamilien iii. (2) p. 49 also E. B. Payson in Contrib. United States Nat. Herb. xx. (4) 135, n. 1 (1918.)

is represented by a mere pouch. *Semiaquilegia*, therefore, forms an important landmark from the phyletic standpoint in that it indicates the origin of *Aquilegia*. One species, *S. Henryi*, points in its vegetative characters rather to *Enemion* or even to *Coptis*.

Aquilegia Jonesii, Parry in Amer. Nat. viii. 211 (1874), a native of the Northern Rocky Mountains, illustrates the intricacy of these intergeneric relations very clearly; the floral whorls are manifestly those of *Aquilegia*, and although the general habit is diverse from the majority of Columbines, it is approached in *A. nivalis*, Falconer, while the foliage and shrubby lower stem are just as characteristically those of *Paraquilegia*.

At pp. 54–55 of the *Illustrations*, Royle has described two species from Upper Kanawar, and depicted them in figs. 3 and 4 on Plate 11, as *Isopyrum grandiflorum* and *Isopyrum microphyllum* respectively. Royle's figure 3 seems to approach *I. caespitosum* of Boissier and Hohenacker, Diagnoses ser. (1) fasc. viii. 7 (1849), of which we have seen an authentic specimen at the Natural History Museum.

In deference to the authority of Maximowicz and of Franchet we have retained the three species just mentioned, although after close examination of a large suite of specimens we are unable to distinguish them satisfactorily in the Herbarium.

With these, which are all of a habit peculiarly adapted to the inhospitable spots in which they grow, we have associated a fourth, which in general appearance inclines towards *Isopyrum* proper, but in the form and arrangement of the follicles to *Leptopyrum*. This extends to the Tian Shan—the inner Himalaya in Western Kashmir and the Chenab basin—also to the Suliman Range at high elevations, from the Alatau, where it was discovered in 1841 by Karelin and Kiriloff,* and described by them in Bull. Soc. Nat. Mosc. xv. 135 (1842) as "*Isopyrum anemonoides*": this name being open to objection, we have exchanged it for (*Paraquilegia*) *uniflora* given (under *Isopyrum*) by Hemsley to Afghanistan specimens (Journ. Linn. Soc. xix. p. 149 publ. 1882).

Paraquilegia is essentially a Central Asian type; even *P. microphylla*, which has by far the widest range of the three shrubby forms, is not found much to the south of the watershed that divides the dry elevated inner valleys skirting the main Asiatic plateau from the monsoon-affected areas of India:—the centre of dispersion seems to have been in the "massif" between the Tian Shan and the basin of the upper Irtish, reaching along the Sayan and connected ranges into eastern Siberia on the one hand, and southwards across the Hindu Kush and the Himalaya to the Alps of Afghanistan and eastern Persia. The rather abrupt diversity of the solitary European type of *Isopyrum* from its allies in the Far East on the one hand, and from *Paraquilegia* on the other, suggests that the absence of these types from the Caucasus and the Ural Mountains may be due to extinction of

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* Succeeded Kusnetsoff—who succumbed after a journey to the Okhotsk Sea—as collector for Turczaninow. Numerous gatherings by Kiriloff, and a few by Kusnetsoff, are in the Hookerian Herbarium at Kew.

intermediate forms, following on climatic changes in those regions. Pampanini (see Fiori, A. Beguinot and R. Pampanini, note on No. 449 *Flora Italica Exsiccata*) believes that *Isopyrum thalictroides* escaped in South Europe the furthest incursion of the Polar ice-sheet, and after the last main recession migrated for the second time into Central Europe.

Leptopyrum, which is annual and has yellow sepals, may have originated in the course of post-glacial fluctuations; from observations by Pallas (*Reise* iii. 318) its headquarters were restricted so recently as 1772, to the sub-alpine tract south of Lake Baical, though it was found more sparingly in various localities at lower levels; like *Fumaria* and *Hypecoum*, which it resembles in its foliage, it has no doubt spread rapidly with extending cultivation.

Enemion is a "natural" group of forms, and its distribution strongly confirms the morphological evidence. The species greatly resemble *Anemone nemorosa* in their foliage and habit. The single Asiatic species was discovered by Radde in the Bureya Mountains, flanking the Amur east of Blagoveshchensk, and was figured and described by Regel (Aufzählung, 1861, p. 61, tab. ii. fig. 3, 4, f, g.). From Franchet and Savatier (Enum. Pl. Jap. Addenda, 1876, p. 270) it appears that *E. Raddeanum* (*i.e.* Regel's plant just mentioned), or a very closely allied species, extends to Japan, but we have seen no specimens from there. This North Pacific region is the home now of the most numerous section of *Isopyrum* as defined in this paper.

In 1883 Maximowicz published a revision of *Isopyrum* (Bull. Acad. Sc. St. Petersb. xi. 623–642); in this he treated *Enemion* as a section merely, and did not discuss the validity of *Leptopyrum*. In addition to the four species placed by us under *Paraquilegia*, plus the European *I. thalictroides*, *I. adiantifolium*, Hook. fil. and T. Thoms. (1855), *I. dicarpon*, Miquel (1867) and *I. adoxides*, DC. (= *Semiaquilegia*, Makino), he admitted the following: *I. nipponicum*, Franchet (1879), *I. anemonoides*, Kar. et Kir. (1842) which we unite with *Paraquilegia uniflora*, *I.* (*Enemion*) *stipitatum*, A. Gray (1876), *I.* (*Enemion*) *Hallii*, A. Gray (1872), *I.* (*Enemion*) *occidentale*, Hook, and Arn. (1840) and *I.* (*Enemion*) *biternatum*, Torrey and Gray (1840); at the same time he added two new species, viz. *I. stoloniferum* (= *I. dicarpon*, Franch. et Savat. Enum. Pl. Japon. ii. 271 (1884), and *I. trachyspermum* (= *I. dicarpon*, S. L. Moore in Journ. Bot. 1878, p. 129)—in either case not the *I. dicarpon* of Miquel.

The next revision was by Franchet in Journ. Bot. Morot. xi. (1897) pp. 187, etc.:—in this he confined his attention to what he regarded as the "Oriental" region, thus excluding eight of the species in Maximowicz' enumeration, *i.e.* the four American, referred by us to *Enemion*, the European *I. thalictroides*, *I. uniflorum* ("anemonoides") and *I. caespitosum* of West Asia, also *I. adiantifolium*, hitherto recorded from Sikkim only, but reported lately from North Burma as well. Franchet's revision included the following:—*I. auriculatum*, Franchet, *I. Henryi*, Oliver, *I. peltatum*, Franchet, *I. raginatum*, Maximowicz, *I. Fargesii*, Franch., *I. Faurieii*, Franch., *I. sutchuenense*, Franch., *I. Delavayi*, Franch.

In 1898 fruiting material of *I. vaginatum*, Maxim., from Abbe Delavay's collections came into Franchet's hands, and he accordingly, taking into account all the observed characters, established the new genus *Soulieu* for the reception of this very peculiar species, which approaches *Cimicifuga* (see page 167).

The latest revision is by Finet and Gagnepain (*Flore d'Asie Orientale*, in Bull. Soc. Bot. Fr. ser. 4, Tom. iv. 402–409, publ. 1904). Their classification is based, unfortunately as we think, on characters taken almost exclusively from the petals; but *Enemion* is not considered. *Leptopyrum* is ignored; *Soulica* is recognised; *Semiaquilegia*, published during 1902, is passed over, but *Isopyrum Henryi*, Oliver, is transferred to *Aquilegia*, "Isopyrum peltatum" is accepted without question, although it breaks down the highly practical distinction set up between the subtribes *Caltheae* and *Isopyreae* by Bentham and Hooker (Genera Plantarum, i. p. 2), and is otherwise almost as obviously out of its affinity as "*I. vaginatum*." Franchet's *I. sutchuenense* is reduced to *I. adiantifolium*, Hook. fil. and T. Thoms.; *I. trachyspermum*, Maxim., is omitted, and, while "*I. anemonoides* Kar. and Kir." is retained as a good species, *I. uniflorum*, Hemsley and Aitchison, which is certainly the same thing, is treated as a variety of *I. grandiflorum*, which suggests that the authors must in this instance have had somewhat inadequate material before them. Otherwise their arrangement is substantially that of Franchet with an important series of corrections as regards *I. auriculatum* and *I. Delavayi*. *I. Delavayi*, which was founded on Delavay No. 4920 (bis) is, as they have pointed out, merely a state of the original *I. auriculatum*, Franch., the latter founded on No. 2095 Ducloux from Tchenfongchang and No. 4951 Delavay from Longki in Yunnan, whereas *I. auriculatum*, Franchet in Journ. Bot. Morot, xi. (1897) p. 220, (nec Franchet in Bull. Soc. Bot. Fr. xxxiii. ut supra) is a distinct species which they have duly described as *I. Franchetii* = No. 5094 Delavay, also collected in the Longki neighbourhood.

The geographical distribution of the genera dealt with in this paper, excluding *Asteropyrum*, may be summed up as follows:—(1) *Paraquilegia*:—one variable species in the Alps of Northern Asia and China, the Inner Himalaya, Eastern Afghanistan and North-Eastern Persia; a second restricted to the loftier ranges of North-Western Asia, the Western Himalaya, and Eastern Afghanistan:—if *P. microphylla* and *P. caespitosa* are ranked as distinct species, then *P. grandiflora* is restricted to the Western Alps of Central Asia and India, and *P. caespitosa* to West Asia with the North-Western Himalaya: *P. microphylla* being absent west of the Indus and the Oxus respectively.

(2) *Leptopyrum*:—one annual species, originally subalpine in the mountains south of Lake Baical, now diffused as a weed of cultivation at lower levels throughout Northern Asia.

(3) *Isopyrum*:—species 12; one in Central and South-Eastern Europe at moderate elevations; a second in the Eastern Himalaya; the remainder—of rather local occurrence in some cases—in Japan, Formosa, Southern Central and North-Western China, also in Yunnan.

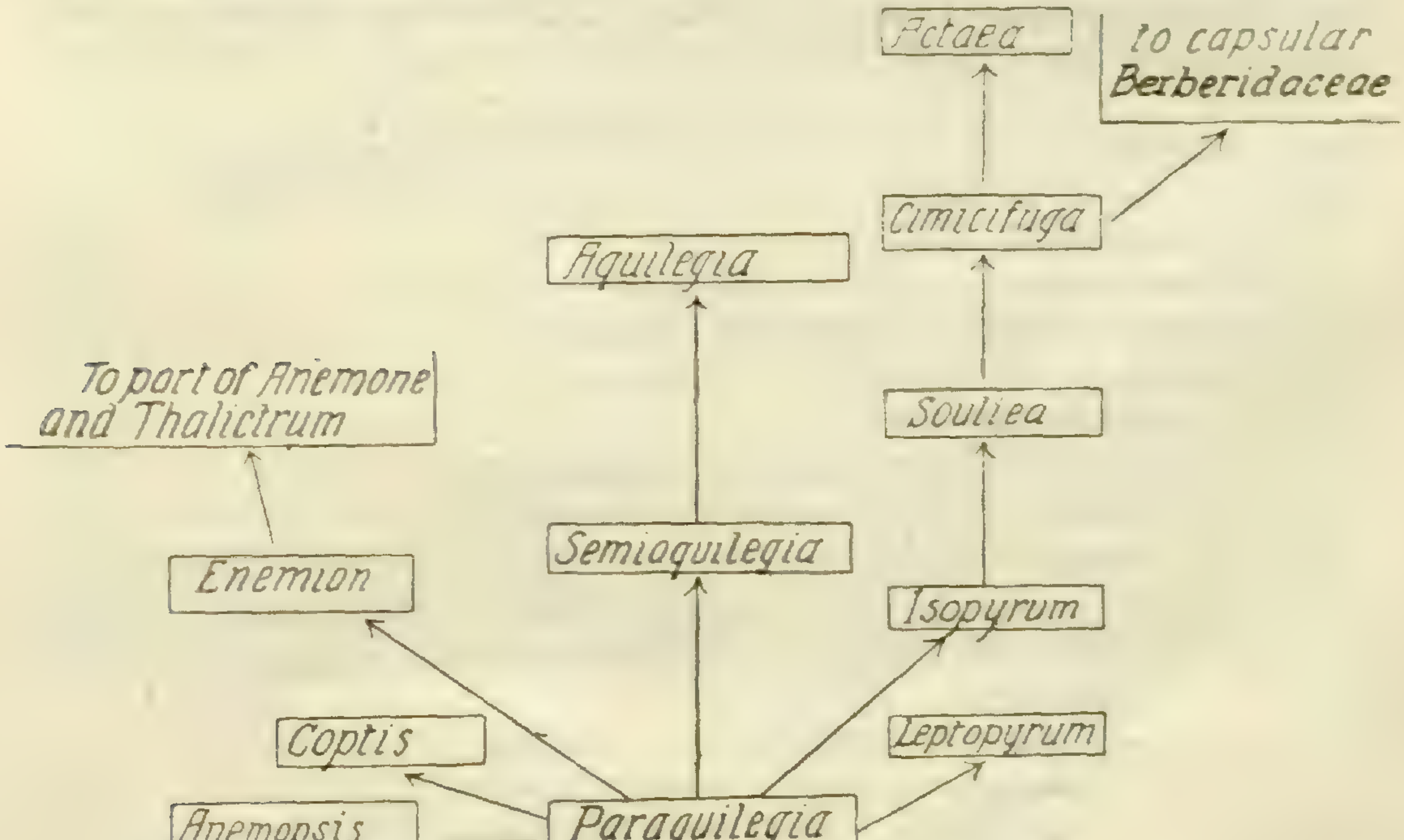
(4) *Semiaquilegia*:—species 4; one in Japan, Chusan and South-east China; two in Central China; one in North-Eastern America—the American form differs from *Aquilegia* in the reduction of the petal-spur solely.

(5) *Enemion*:—species 5; one in N.E. Asia and Japan; the rest in N.W. America.

(6) *Souliea*:—a single species, recorded from Kansu, Szechuan and Yunnan.

Pending further study of the living plants, and particularly of ripe seeds which seem often not to be perfected, we have not attempted to indicate the exact distribution of the *grandiflora* group of species of *Paraquilegia;* the exsiccata have been placed under one or other of the types recognised by Maximowicz to the best of our ability, but with great diffidence. Except where otherwise stated the specimens quoted have been examined by us.

Our views on the probable phylogeny of this group may be shown as follows:—



Paraquilegia seems to present the more primitive features of the group, and it probably gave rise to most of the other genera dealt with in the present paper. For instance there is quite an easy transition from *Paraquilegia* to *Semiaquilegia*, with *saccate* petals, the only remaining link showing the origin of the remarkable genus *Aquilegia*, which, as evidenced by the great variability of its species and its wide range, is probably still in a state of flux. It is extremely doubtful whether this line of development proceeded any further than *Aquilegia*. Then *Paraquilegia* seems to indicate the starting point for another line of development, *i.e.*, in the reduction of the number of carpels to two, as in *Isopyrum*, and at length to one accompanied in the latter case by aggregation of the flowers into racemes resulting in the genera *Souliea* (fig. 8). *Cimicifuga* and *Actaea*, which in their turn may have been the progenitors of certain herbaceous *Berberidaceae* (for instance *Epimedium*).

The genus *Souliea*, separated from *Isopyrum* by Franchet, forms the bridge between *Paraquilegia* and the *Cimicifugeae*, and of the latter an extreme reduction may be the remarkable genus *Achlys* in *Berberidaceae*, which has the inflorescence of *Cimicifugeae*, but has no perianth. Then again the genus *Enemion* seems to be a direct offshoot from *Paraquilegia*, the divergence here being the entire reduction of petals and the tendency to an umbellate arrangement of the flowers. The remarkably close affinity of two species of this genus, *E. Raddeanum* from Manchuria, and *E. Hallii* from Oregon, is worthy of note.

Asteropyrum (fig. 1), a genus described below for the first time, is not shown in the phylogenetic table above because its true position seems to be in the neighbourhood of *Caltha* and *Trollius*.

We are much indebted to Professor Bayley Balfour and Dr. A. B. Rendle for allowing us to examine the material in the herbaria under their charge, to Miss E. Milner for general assistance, and to Miss D. M. Rolfe for help with the text figures.

Key to the genera separated from *Isopyrum*.

Flowers solitary or rarely subumbellate; carpels more than 1:
Staminodes absent:
Carpels several, always more than 2:
Petals present, sometimes small and much modified:
Leaves peltate; carpels spreading stellately in fruit; petals stipitate and indusiform (see fig. 1) 1. **Asteropyrum** (gen. nov.)
Leaves not peltate, usually much divided:
Caespitose perennials; carpels usually about 5, mostly erect in fruit; petals not tubular at the base ... ... 2. **Paraquilegia** (gen. nov.)
Annuals; carpels about 12 or more; petals tubular at the base ... ... 3. **Leptopyrum,** *Reichb.*
Petals absent; inflorescence often umbellate ... ... 4. **Enemion,** *Raf.*
Carpels 2 (rarely 3), divaricate in fruit; perennials ... ... 5. **Isopyrum,** *L.*
Staminodes membranous and flat within the fertile stamens; petals saccate at the base ... ... 6. **Semiaquilegia,** *Mak.*

Flowers several in short racemes; leaves vaginate at the base; carpel 1 ... ... 7. **Souliea,** *Franch.*

Asteropyrum, *nobis*, genus novum foliis peltatis petalis longe stipitatis indusiaeformibus carpellis numerosis demum stellato-patentibus distinctum. Ob folia peltata in subtribum Calthearum removendum est, nisi characteres subtribium secus Genera Plantarum (Benth. et Hook. f.) mutentur; follicula eis Trollii omnino simillia videntur.

Species 2, chinenses.

Folia haud vel leviter lobata	1. *A. peltatum.*
Folia profunde 3–5-lobata, lobis triangularibus acutis...	2. *A. Cavaleriei.*

1. **Asteropyrum peltatum,** *nobis*, comb. nov.

Isopyrum peltatum, Franch. Pl. David. ii. 8, t. 4. (1888).

Descr. emend.—*Rhizoma* abbreviatum, radicibus exiguis pilis rufis minutis. *Folia* omnia radicalia, longe petiolata, peltata, ambitu obtuse subpentagona vel suborbicularia, undulate lobata et dupliciter crenulata vel denticulata, 2–4·5 cm. diametro, chartacea, obscure nervosa, supra marginem versus subappresse setuloso-pubescentia, infra glabrescentia; petioli parum carnosi, usque ad 9 cm. longi, basi in auriculas membranaceas suborbiculares purpurascentes dilatati, parce retrorsum pilosi, purpurascentes. Pedunculi e rhizomate orti, solitarii vel plures, simplices vel rare biflori, foliis aequilongi vel multo longiores, fere glabri, apices versus bracteis approximatis vel alternantibus ovatis obtusis circiter 4 mm. longis instructi. *Flos* albus, circiter 1·3 cm. expansus. *Sepala* late obovata, apice rotundata, 5–7 mm. longa, 3·5–4·5 mm. lata, distincte 5-nervia, sicco fere membranacea, glabra. *Petala* quam sepala dimidio breviora, stipitato-indusiaeformia, circiter 3 mm. longa. *Stamina* petalis paullo longiora; antherae 1 mm. longae. *Carpella* circiter 10, sub anthesi erecti, matura stellatim patentia, subcoriacea, vix reticulata vel rugosa, demum obscure torulosa, circiter 8 mm. longa

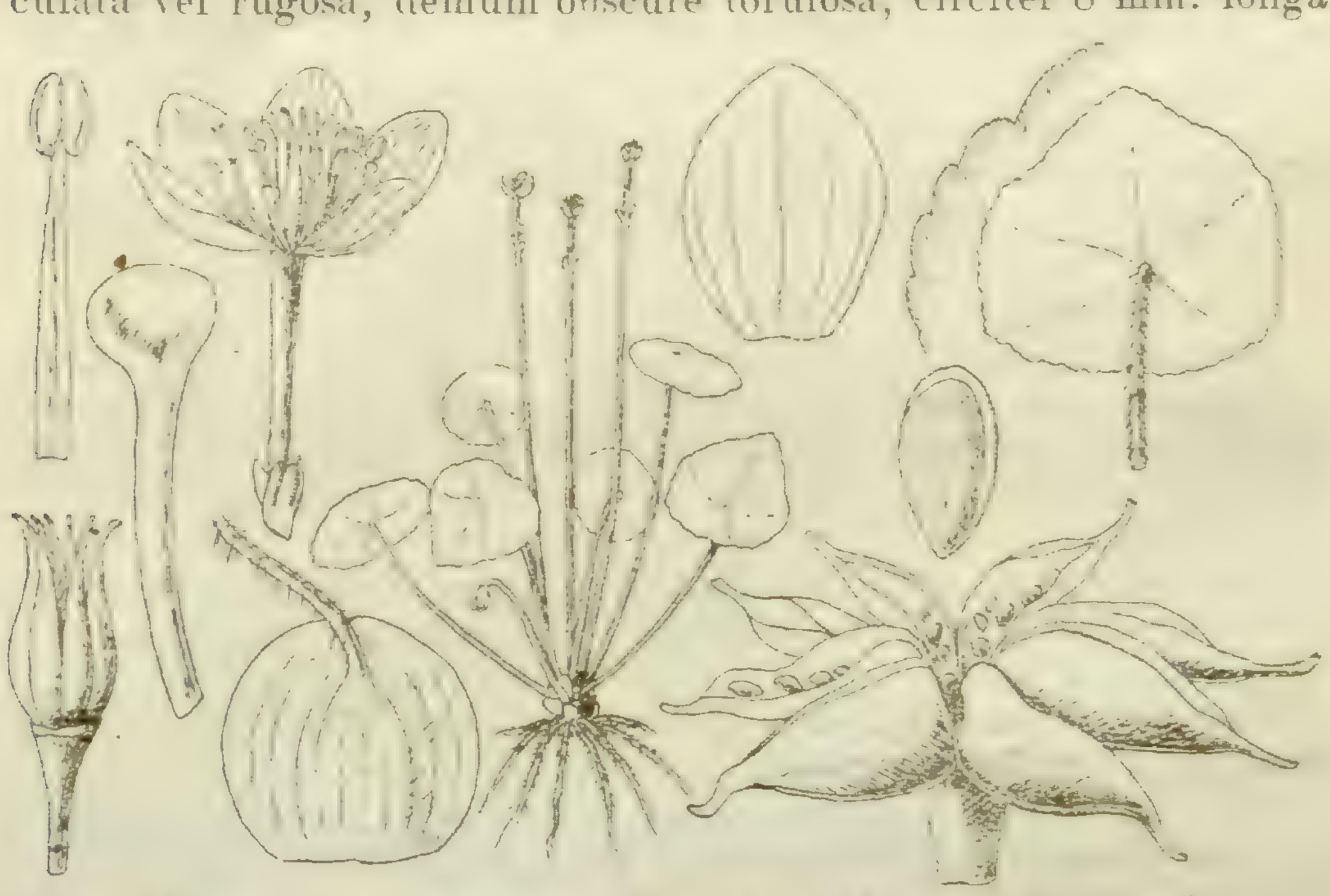


Fig. 1.—ASTEROPYRUM PELTATUM (whole plant $\frac{1}{4}$ nat. size); dissections enlarged.

et 2·5 mm. lata, in stylum subtriquetrum circiter 2 mm. longum rectum plus minusve producta, stigmate obscuro minute bifido. *Semina* ellipsoidea, 1·5 mm. longa, castanea, obscurissime striata, margine subcarinata.

China. Szechuan: South Wushan, *A. Henry*, 5630. Han-kyse, near Tchen-Kiou, 1400 m., 2 Apr. 1896, *R. P. Farges* 1148. Western Hupeh: fls. white, moist rocks, 1350–2100 m., *E. H. Wilson* (Veitch Exped.) 3078; without definite locality, *E. H. Wilson* (Veitch Exped.) 1849; (Arn. Arb. Exped.) 2369; mossy places in forests at Fang Hsien, 2400–2850 m., 16 May, 1907, *E. H. Wilson* (Arn. Arb. Exped.) 3311.

2. **Asteropyrum Cavaleriei,** *nobis*, comb. nov.

Isopyrum Cavaleriei, Leveille et Vaniot in Bull. Soc. Bot. Fr. li. 289 (1904).

China. Kweichow: Pinsa, by waterfalls, 11 Mar. 1902, *Cavalerie* 1345; without locality, *Lesquirol* 436 (Herb. Edinb.).

Paraquilegia, *nobis*, genus novum habitu dense caespitosum foliis 2–3-ternatisectis petalis sessilibus suborbicularibus basi concavis apice plus minusve profunde emarginatis carpellis plerumque 5–7 erectis vel rare demum patulis seminibus carinatis vel anguste alatis nitidis distinctum.—*Isopyrum*, Auct. partim.

Species 4, e montibus altioribus Asiae Centralis usque ad Siberiam orientalem, Persiae, et Affghaniae, Emodi interioris et Sinae occidentalis.

Carpella fructu plus minusve erecta; caules caespitosi, rigidi:	
Folia glabra, 2–3-ternatisecta; flores speciosi, circiter 2–3 cm. diametro:	
Semina puberula	1. *P. grandiflora.*
Semina glabra	2. *P. microphylla.*
Folia minute puberula, plerumque simpliciter trifoliolata; flores satis minores	3. *P. caespitosa.*
Carpella fructu patula; caules graciles decumbentes, solitarii vel pauci	4. *P. uniflora.*

1. **Paraquilegia grandiflora,** *nobis*, comb. nov.

Isopyrum grandiflorum, Fisch. ex DC. Prodr. i. 48 (1824); Maxim. in Bull. Acad. Sci. St. Peters. xi. 627 (1883). *I. grandiflorum*, var. *songarica*, Trautv. in Bull. Soc. Nat. Mosc. 1866, 2. *Aquilegia anemonoides*, Willd. in Mag. Ges. Naturf. Fr. v. 401, t. 9, fig. 6.

Central Asia. South Siberia: Alps of Lake Baical, 1830, *Turczaninow*. Altai, *Herb. Prescott*. Turkestan: *Socalski* 122. Ili, *Krassnoff*.

China. Western Kansu: Tangut country, 1892, *Przewalski*. Nan Shan, 1879, *Przewalski*.

The following specimens appear to be assignable to this species on the characters relied upon by Maximowicz:—

China. Western Kansu: Lien-wha-shan, 3500–3800 m., *Purdom* 737.

India. Kumaon: Topidhunga, 5000 m., *Strachey and Winterbottom*. Garhwal: Niti Pass, 5000 m., *Madden* 3070 (Herb. Edinb.). Kunawar, *Jacquemont* 711. Piti, *T. Thomson*. Lahul, *Jaeschke* 155. Sauch Pass, *Ellis* 1638. Kashmir: *Duthie* 13218; 13760; 25460; *Sahni* 273; *J. R. Drummond* 14223. Kurrum: Mt. Sikaram, 4100 m., *Aitchison* 207. Baltistan, *Duthie* 11897 (Herb. Mus. Brit. and Edinb.). Hazara, *Duthie* 20727.

2. **Paraquilegia microphylla,** *nobis*, comb. nov.
Isopyrum microphyllum, Royle, Ill. 54, t.l. fig. 4 (1839).

Central Asia. South Siberia: Alps of Lake Baical, 1830, *Turczaninow*. Balachte, 1834, *Kuznetsoff*. E. Siberia, *Stubendorff*. Saiansk Mts., *Augustanioff*. Alatau Mts., *Karelin and Kiriloff* 1161.

China. Thibet: *Przewalski* (1884). Kigichu Valley, 15 miles east of Lhassa, Sept. 1904, *Walton*. Mongolia: mts. around Lake Ubsa, 1879, *Potanin*. Western Szechuan: Tatsienlu, *Soulié* 117, 834. Yunnan: Mekong-Yangtse and Mekong-Salween divides, *Kingdon-Ward* 430, 510, 581; *Forrest* 16759; Tsekou, *Soulié* 1040; mountains near Chungtien, 4100 m., Aug. 1914, *C. K. Schneider* 2393. Mupin, 2200–2400 m., *E. H. Wilson* (Arn. Arb. Exped.) 3313. Lichiang Range, *Forrest* 5099, 5722, 10301.

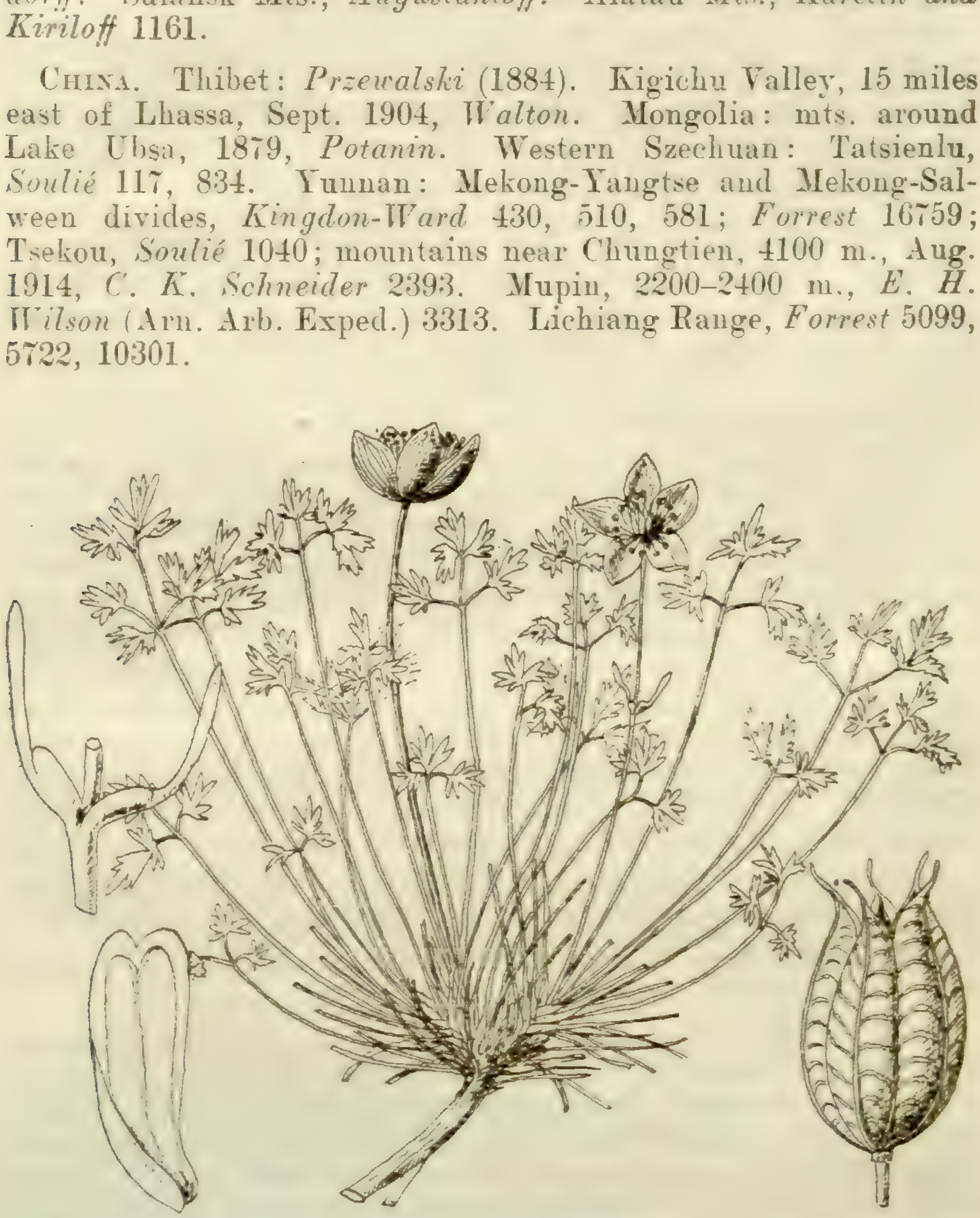


Fig. 2.—Paraquilegia microphylla ($\frac{2}{3}$ nat. size).

India. Sikkim: Naku La, *Younghusband* 220. Llónok, 5400 m., Jan. 1909, *Smith and Cave* 2313. Kumaon: Pindari, 4200 m., *Strachey and Winterbottom;* J. L. Stewart 712; *Herb. Falconer* (Kew Distrib. 54). Garhwal: *Madden* 3053 (Herb. Edinb.). Sources of the Janma, *Jacquemont* 712. Nila Valley, *Duthie* 746. *Hangorang Pass,* 4200 m., *J. R. Drummond* 4340. Kanawar, *Munro* 27; *Watt* 13669 (Herb. Edinb.). Hamta Pass, Kulu, 4200 m., *J. R. Drummond* 8318. Sauch Pass, 4200 m., *Lace* 1615. Laka, *Edgeworth.* Above Rotang Pass, Kulu, 4800 m., *Herb. J. R. Drummond* 8314. Kelang, Lahoul, *Watt* 2496 (Herb. Edinb.). Hazara, *Duthie* 19104, and several other unnumbered gatherings.

3. **Paraquilegia caespitosa,** *nobis*, comb. nov.

Isopyrum caespitosum, Boiss. et Hoh. Diagn. Ser. i. viii. 7 (1849); Boiss. Fl. Or. i. 64 (1867).

Persia. Mt. Elbrus, 3500 m., 11 July, 1843, *Kotschy* 501 (type).

Afghanistan. Suliman Mts., *Aitchison* 121.

Turkestan. By Lake Kuli-Kalon, 2800 m., *Komaroff.*

India. Kashmir: near Daranshi Camp, 3620 m., *Conway* 45, 46. Deosir, *Falconer* 2872. Baltistan, *Falconer* 3653. Saskatti Pass, *J. R. Drummond* 14223 A.

4. **Paraquilegia uniflora,** *nobis*, comb. nov.

Isopyrum anemonoides, Kar. et Ker. Enum. Pl. Songor, n. 55 (1842), non *Aquilegia anemonoides*, Willd. in Mag. Ges. Naturf. Fr. v. 401, t. 9, fig. quae = **Paraquilegia grandiflora,** *nobis;* Maxim. Mel. Biol. xi. 633 (1883). *Isopyrum uniflorum*, Aitch. et Hemsl. in Journ. Linn. Soc. xix. 149 (1875).

Turkestan. Alatau Mts., at the sources of the Lepsa and Sarchan, rare, *Karelin and Kiriloff* 1162; without definite locality, *Fedschenko.* Lake Kuli-Kalon, 3000 m., *Komarov.* Margusar-kul, 2000 m., *Komarov.* Djidjik, 2250 m., *Komarov.* Voru River, 2400 m., *Komarov.* Pasrud and Pinchon, 2250 m., *Komarov.* Tian Shan, *Osten Sacken.* Semirechensk District, *Socalski* 258. Zamma River, *Przewalski.* Pamir, *Kuschakewicz.*

Afghanistan. Kohl Baba, 4500–4700 m., *Griffith* (Kew Distrib. 39). Seratigah, 4200 m., 1879, *Aitchison.*

China. Sinking: Tian Shan Mts., at the source of the Zanma, *Przewalski* (1877). Kansu, *Przewalski* (1880).

India. N.W. Provinces: Safed Koh Range, Shendtoi Valley, 3000 m., *Aitchison* 802. Gilgit, *Tanner* 205. Kashmir; Bhangsa, *Herb. Falconer* 3359. Above Dras, 3500–3800 m., *Duthie* 13788. Kishiyanga Valley, 3200 m., *Winterbottom* 535. Punjab Himalaya: Lahul, Upper Bhanga Valley, 3100–4300 m., *Stoliczka;* 4300 m., *Herb. J. R. Drummond* 8312: glacier lake, Garugan-tal, Kulu, *Herb. J. R. Drummond,* 8313. On the way to the Kukti Pass, Chamba, *Watt* 3171 (Herb. Edinb.). Zanscar-tsu, *Watt* (Herb. Edinb.).

Leptopyrum, *Reichb.* Consp. 192 (1828).

Leptopyrum fumarioides, *Reichb.* l.c.; Ic. Fl. Germ. iv. 26, t. cxiii. b. (1839); Spach, Hist. Veg. vii. 328 (1839).

Isopyrum fumarioides, Linn. Sp. Pl. 557 (1753).

Helleborus fumarioides, Lamk. Encycl. iii. 99 (1789).

Isopyrum fumariaefolium, Salisb. in Trans. Linn. Soc. viii. 306 (1807).

Eastern Asia: In mountain places from the Altai to Amur, South to Kansu; naturalised in parts of Europe.

Fig. 3.—Leptopyrum fumarioides (nat. size, dissections and fruits enlarged).

Enemion, *Rafin.* in Journ. Phys. xci. 70 (1820).

§I. Euenemion, *nobis*.—Flores solitarii.

Carpella stipitata; stamina circiter 10 ...	1. *E. stipitatum.*
Carpella haud stipitata:	
Carpella plurisperma (usque ad 6); semina granulata	2. *E. occidentale.*
Carpella 1–2-sperma; stamina numerosa; semina laevia	3. *E. biternatum.*

§II. Umbellata, *nobis*.—Flores umbellati.

Petioli petiolulis multo breviores; sepala basin versus angustata; umbellum simplex; Asia bor. or.	4. *E. Raddeanum.*
Petioli petiolulis aequilongi vel longiores; sepala basi lata; umbellum compositum, umbellulis bracteatis; Am. bor. occid.	5. *E. Hallii.*

1. **Enemion stipitatum,** *nobis*, comb. nov.
Isopyrum stipitatum, A. Gray in Proc. Am. Acad. xii. 54 (1876).
N. America. N. California, *E. L. Greene.*

2. **Enemion occidentale,** *nobis*, comb. nov.
Isopyrum occidentale, Hook. et Arn. Bot. Beech. Voy. 316 (1841); Torr. et Gray, Fl. N. Am. i. 660 (1840); Brewer and Wats. Bot. of Calif. i. 9 (1876); Jeph. Fl. W. Midd. Calif. 194 (1901).

N. America. California, without definite locality, *Douglas.* Near Forest Hill, Placer Co., among bushes in loose light soil, Apr. 12. 1865. *H. N. Bolander* 4553. Mariposa, *Congdon.* Coast Ranges: Weldon Canon, Vaca Mts., Mar.–Apr., *Jephson.* Amador County, 940 m., *G. Hansen* 737. Mt. Hamilton Range, *Heller* 8934. San Benito, *Elmer* 4900.

var. **coloratum,** *nobis.* Flowers red. *I. occidentale*, var. *coloratum*, Greene in Erythea, i. 125 (1893).

California: Santa Cruz Mts., Fremont's Peak, Mar.–Apr. 1893, *L. W. Cushman* (not seen).

3. **Enemion biternatum,** *Raf.* in Journ. Phys. xci. 70 (1820).
Isopyrum biternatum, Torr. et Gray, Fl. N. Am. i. 660 (1840). Britt. et Br. Ill. Fl. N. States and Canada, ii. 89, fig. 1860 (1913).
E. N. America. In moist woods and thickets, Ontario to Minnesota, Kansas, Florida and Texas (fide Britt. & Br. l.c.).

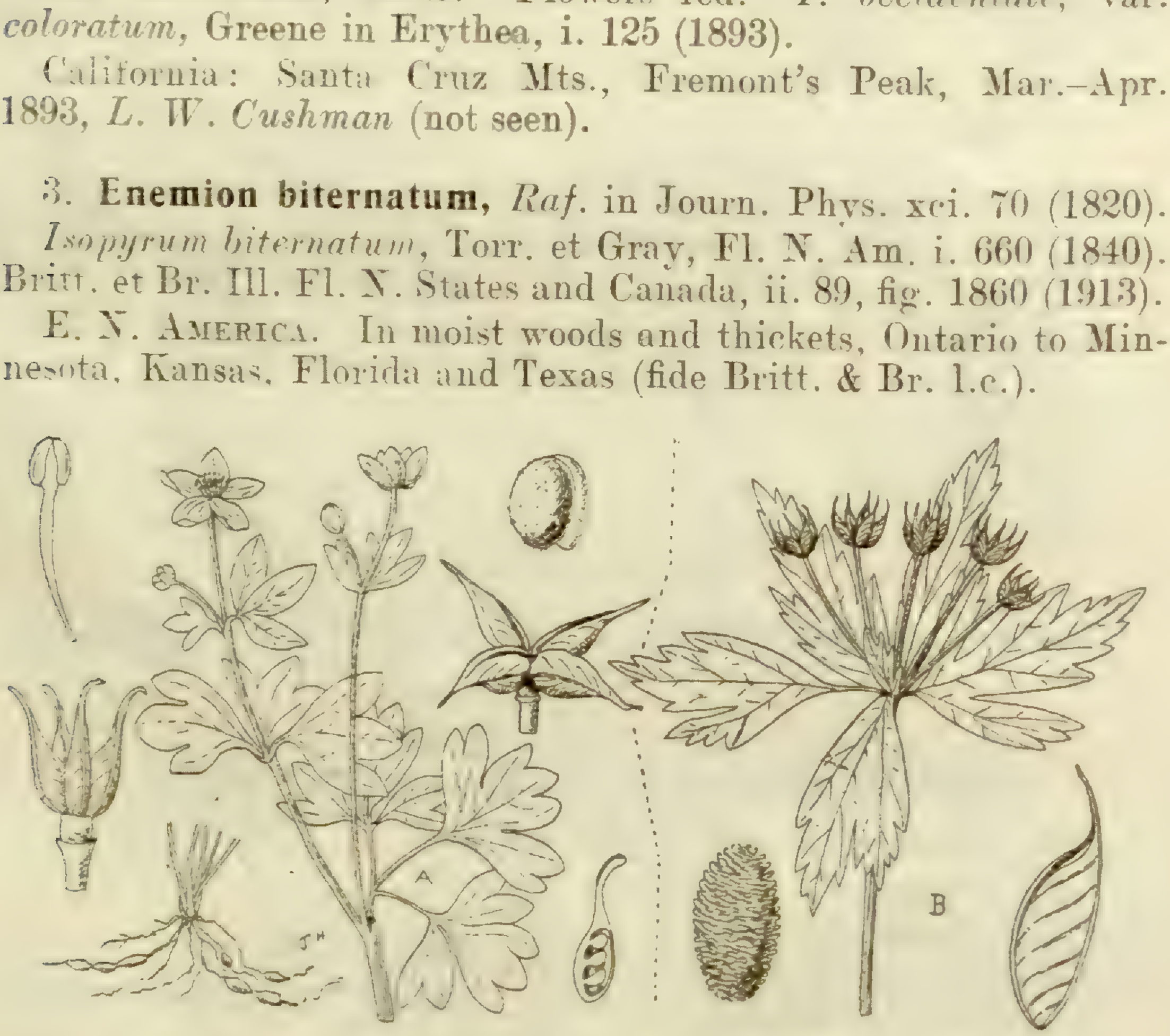


Fig. 4.—A. Enemion biternatum. B. Enemion Raddeanum (½ nat. size, dissections enlarged).

4. **Enemion Raddeanum,** *Regel* in Bull. Soc. Nat. Mosc. xxxiv. ii. 61, tab. ii. fig. 3, 4, f.g. (1861).
Isopyrum Raddeanum, Maxim, Mél. Biol. xi. 639 (1883).
Manchuria. Moukden to Yalu River, at Laoling, *Rev. J. Webster* 130. Li Fudin river, 1860, *Maximowicz.* In moist woods, Srednija Valley, Amur river, 28 May 1895, *Komarov* 661 (Herb. Kew). Bureia river mountains, *Radde.*

Corea. Musang district, 23 May, 1897, *Komarov* 661 (Herb. Mus. Brit.). A variety *japonica* is recorded by Franchet (Enum. Pl. Savat. ii. 271). We have not seen any Japanese specimens.

5. **Enemion Hallii,** *nobis*, comb. nov.
Isopyrum Hallii, A. Gray in Proc. Amer. Acad. vii. 374 (1872).
N. America. Oregon: without precise locality, 1871, *Elihu Hall* 10 (type).

Isopyrum, *Linn.* (emend.).

Petali unguis limbo multo brevior; species europea	1. *I. thalictroides.*
Petali unguis limbo longior; species asiaticae:	
Torus demum tumescens et circa summum pedicellum in forma coni truncati excavati deflexus:	
Semina laevia nitidaque:	
Petali limbus integer	2. *I. stoloniferum.*
Petali limbus emarginatus	3. *I. nipponicum.*
Petali limbus oblique bilabiatus ...	4. *I. dicarpon.*
Semina muricata vel tuberculata (fig. 5 c):	
Petali limbus stipite sua 1–2 plo brevior; semina laxe tuberculata	5. *I. trachyspermum.*
Petali limbus stipitem suam aequans; semina dense muricata	6. *I. Fauriei.*
Torus haud tumescens:	
Semina laevia nitidaque, plus minusve globosa:	
Foliolum terminale lanceolato-ellipticum, circiter medium latissimum (fig. 6 A):	
Inflorescentia subscaposa ...	7. *I. Dalzielii.*
Inflorescentia foliosa	8. *I. auriculatum.*
Foliolum terminale plus minusve obovato-orbiculare, supra medium latissimum (figs. 6 B, C):	
Petali limbus integer	9. *I. Franchetii.*
Petali limbus emarginatus:	
Foliolum terminale ut in fig. 6 B	10. *I. sutchuenense.*
Foliolum terminale ut in fig. 6 C	11. *I. adiantifolium.*
Semina reticulata, utrinque acuta (fig. 5 B)	12. *I. Fargesii.*

1. **Isopyrum thalictroides,** *Linn.* Sp. Pl. i. 557 (1753): DC. Prodr. i. 48; Maxim. in Bull. Acad. Sci. St. Petersb. xi. 631 (1883). *Helleborus thalictroides*, Lam. Fl. Fr. iii. 315 (1778). *Fontanella tertiaria*, Pluk. ex. Bers. Prim. Fl. Gal. ii. 363 (1808). *Gontarella tertiaria*, Gilib. ex Steud. Nom. ed. i. 380 (1821). *Olfa thalictrifolia*, Bub. Fl. Pyren. iii. 378 (1901).

EUROPE. Mountains from the Pyrenees to the Ardennes and to Warsaw, south to the Abruzzi, Albania and the Northern Balkans.

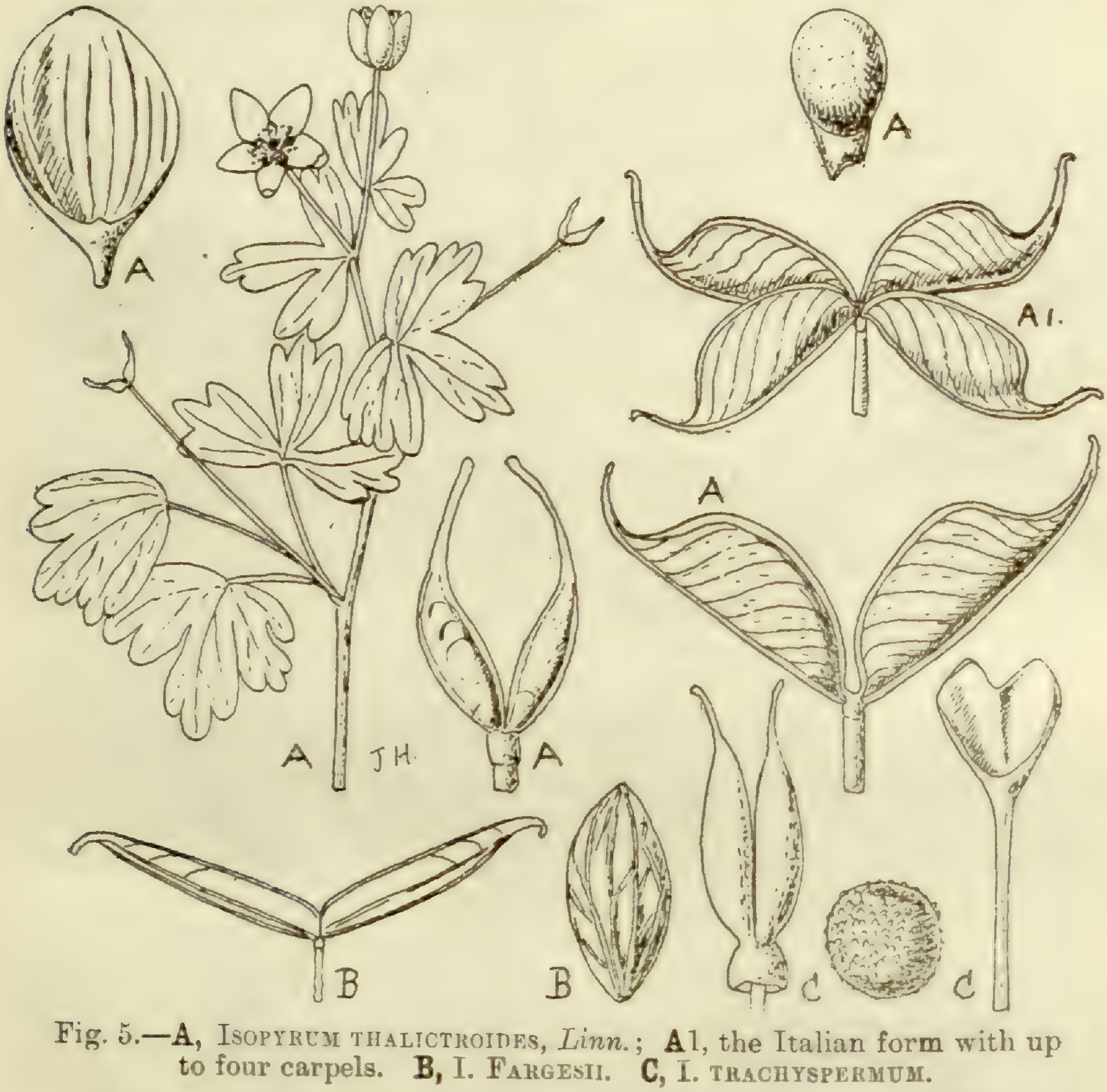


Fig. 5.—**A**, ISOPYRUM THALICTROIDES, *Linn.*; **A**1, the Italian form with up to four carpels. **B**, I. FARGESII. **C**, I. TRACHYSPERMUM.

2. **Isopyrum stoloniferum,** *Maxim.* in Bull. Acad. Sci. St. Petersb. xi. 636 (1883); Franch. in Journ. de Bot. xi. 222 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904).

Isopyrum dicarpon, Franch. et Savat. Enum. i. 11, ii. 271, non Miq.

JAPAN. Nippon: Senano Province, *Tschonoski!* Fudziyama woods, *Tschonoski* (type). Mt. Fuzi, Suruga Province, July 26, 1881, *Sci. Coll. Herb.* (Japan); *Sakurai* (Herb. Edinb.); *Takeda* (Herb. Edinb.).

3. **Isopyrum nipponicum,** *Franch.* in Bull. Soc. Bot. Fr. xxvi. 82 (1879); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 631 (1883); Franch. in Journ. de Bot. xi. 220 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 407 (1904).

JAPAN. Nippon: Etchigo Province, moist rocks near the Nitsu waterfall, *Faurie* 619 (fide Franch.). Kanasava Mountain, *Faurie* 7951. West of Shimidzutage, *Faurie* 2585 (fide Franch.).

We have seen only a rather fragmentary specimen of this species, which is not readily separated from *I. dicarpon* except by the form of the petals.

4. **Isopyrum dicarpon,** *Miq.* Prol. 195 (1867); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 635 (1883); Franch. in Journ. de Bot. xi. 221 (1897); Finet and Gagnep. Bull. Soc. Bot. Fr. li. 407 (1904). *Isopyrum stipulaceum*, Franch et Savat. Enum. Pl. Jap. ii. 270 (1874), fide Maxim. l.c.

Japan. Nagasaki: Koisiwara, in woods, 1863, *Maximowicz.* Idu Province; Mt. Amagi, June 12, 1883, *Sci. Coll. Herb.* (Japan). Kiusiu, *Savatier* (fide Franch.).

5. **Isopyrum trachyspermum,** *Maxim.* in Bull. Acad. Sci. St. Petersb. xi. 636 (1883); Franch. in Journ. de Bot. xi. 219 (1897). *Isopyrum dicarpon*, S. Moore in Journ. Bot. 1878, 129, non Miq.

Japan. Mountains of Nikko and Oyama, *Bisset* 964. Miogisan, *Bisset* 3653 (Herb. Edinb.). Hakone, *Bisset* 3876 (Herb. Edinb.). Chichibu, Unsashi Province, *Sci. Coll. Herb.* (Japan). Woods at Tsukubasan, Hitachi Province, *Takeda.* Mt. Tanzawa, *Sakurai* (Herb. Edinb.).

6. **Isopyrum Fauriei,** *Franch.* in Journ. de Bot. xi. 218 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904).

Japan. Nippon: Senano Province, near Asama-Yama, May 1892, *Faurie* 8018.

We have not, unfortunately, seen a specimen of this species and we have relied in our key on the characters given by Franchet (l.c.). It may be a form of *I. trachyspermum*, Maxim., which was omitted from their revision of the genus by Finet and Gagnepain.

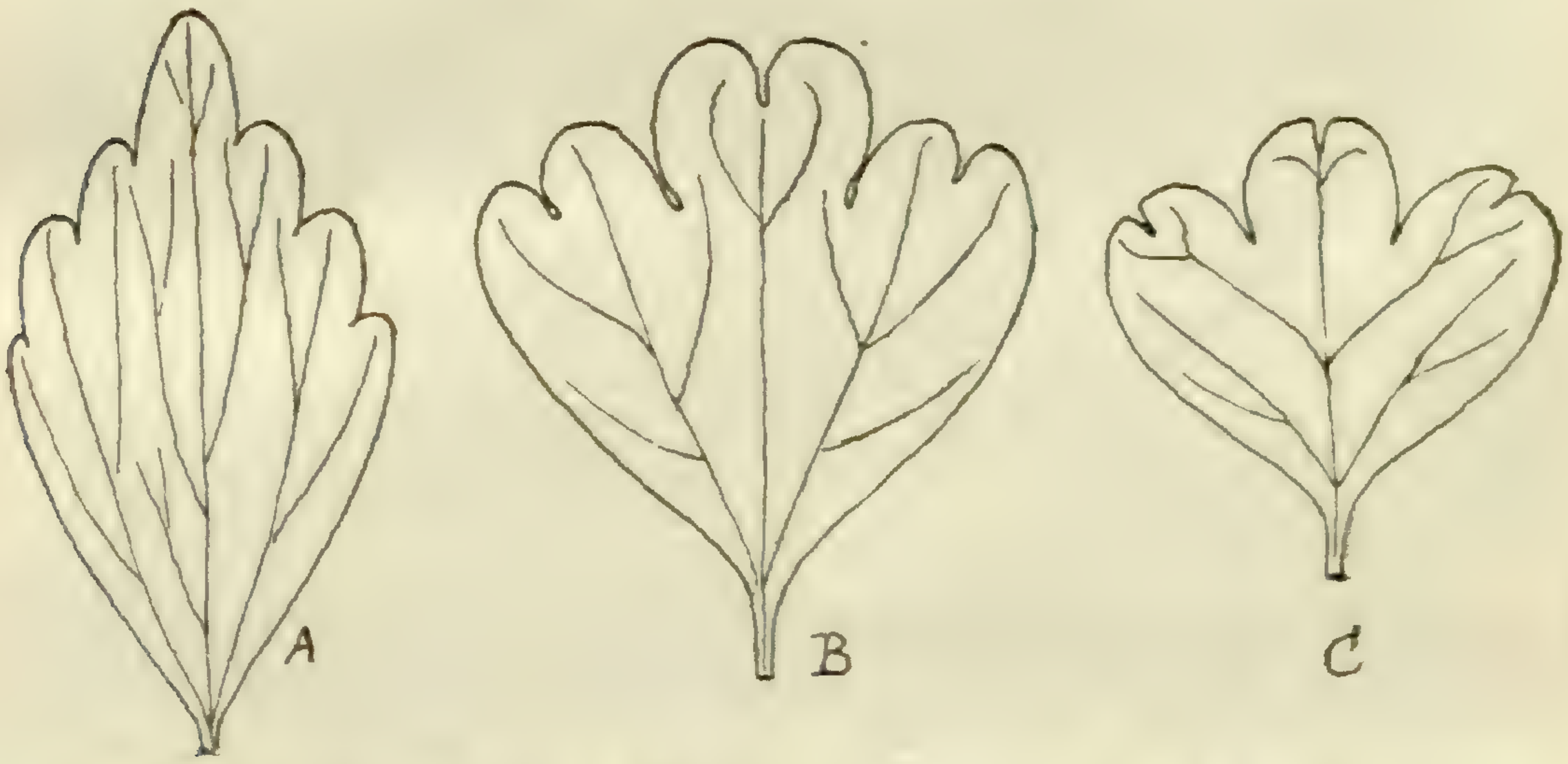


Fig. 6.—Terminal leaflets of **A,** Isopyrum auriculatum; **B,** I. sutchuenense; **C,** I. adiantifolium (**B** and **C** enlarged).

7. **Isopyrum Dalzielii,** *nobis*, sp. nov.

Herba bispithamea, radice fibrosa. *Folia* omnia radicalia, petiolis basi abrupte auriculatis supra profunde canaliculatis glabris usque ad 3 cm. longis suffulta, pedatim vel digitatim ternata vel rarius abortu biloba, circiter 4 cm. extensa, segmentis ovato-rhomboideis basi breviter cuneatis apice obtusis

vel emarginatis irregulariter crenulatis glabris infra glaucescentibus, petiolulis teneris terminale usque ad 5 mm. longo. *Inflorescentia* efoliata, laxe cymosa, ramis subcapillaribus, bracteis trisectis ad 4 mm. extensis munita; pedicelli ultimi bibracteolati, usque ad 3·5 cm. longi. *Sepala* ovata, obtuse acuminata, fere 1 cm. longa. *Petala* sepalis dimidio breviora, spathulata, apice bifida. *Carpella* duo, ensiformia, circiter 1 cm. longa, demum divergentia et chartacea, in stylum persistentem stramineum tenuem producta. *Semina* laevia, castanea, nitentia, late ovoidea, quasi carinata.

China. Kwangtung: Wu-king-fu, about 60 miles west of Swatow, *J. M. Dalziel* (Herb. Edinb.).

8. **Isopyrum auriculatum,** *Franch.* Pl. Delavay. 23, t. 6 (1889); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904).

Isopyrum Delavayi, Franch. in Journ. de Bot. xi. 222 (1897).

China. Szechuan: Mt. Omi, *E. H. Wilson* (Veitch Exped.) 4699; without locality, *E. H. Wilson* (Veitch Exped.) 3087. Western Hupeh: *E. H. Wilson* (Veitch Exped.) 2672. Tchen-fong-chan, June 1894, *Delavay* 4920 bis. Longki, *Delavay* 4951.

9. **Isopyrum Franchetii,** *Finet et Gagnep.* in Bull. Soc. Bot. Fr. li. 405 (1904). *Isopyrum auriculatum*, Franch. in Journ. de Bot. xi. 220 (1897), non in Pl. Delav. le.

China. Yunnan: mountain woods of Long-ki, Apr. 1894, *Delavay* 5094! (type). Hupeh: South Patung, *A. Henry* 5374! without locality, *A. Henry* 5252! Kweichow: Pinsa, *Cavalerie* (Herb. Edin.).

10. **Isopyrum sutchuenense,** *Franch.* in Journ de Bot. viii. 274 (1894); Franch. l.c. xi. 219 (1897). *I. adiantifolium*, Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904), partim, non Hook. f. and Thoms. *Isopyrum adiantifolium*, var. *arisanensis*, Hayata in Journ. Coll. Sc. Tokyo, xxx. 21 (1911).

China. Szechuan: Tchen-keou-tin district, 2000 m., May, *Farges* 794. South Wushan, *A. Henry* 5558. Western Hupeh: without definite locality, *E. H. Wilson* (Veitch Exped.) 258. 518. Patung, *E. H. Wilson* (Veitch Exped.) 448. Kweichow? *Esquirol* 432. Formosa: Arisan, 2500 m., *Kawakami & Mori*, 578* (Herb. Mus. Brit.).

11. **Isopyrum adiantifolium,** *Hook. f. et T. Thoms.* Fl. Ind. i. 42 (1855); Fl. Brit. Ind. i. 23 (1875); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 634 (1883); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904), partim.

India. Sikkim: Pachim, 2150 m., *Hooker and Thomson*; Darjeeling, *T. Thomson*; *Griffith*; *Treutler* 72; Tonglo, 2400 m., June 4, 1884, *C. B. Clarke*, 25641, 35899; *Lacaita* 15719: Rungvroong, Sept. 7, 1869, 1950 m., *C. B. Clarke* 9118; Dikeeling, 2400 m., May 11, 1876, *C. B. Clarke* 27870; On the way to Sandukfu, *Watt* 5359 (Herb. Edinb.). Upper Burma: Lashi

* This Formosan specimen does not show the number of the stamens which are stated by Hayata to be five in number.

country; Htawgau, valley of Naung-chaung, 2220 2250 m., *Kingdon-Ward* 1601 (Herb. Edinb.).

12. **Isopyrum Fargesii,** *Franch.* in Journ. de Bot. xi. 194 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904).

China. Szechuan: near Tchen-keou-tin, *Farges* (type). Hupeh: A. *Henry* 5558 A. Kweichow: Pinsa, *Cavalerie* (Herb. Edinb.). Gaupin, *Cavalerie* 2109 (Herb. Edinb.).

Semiaquilegia, *Makino* in Jap. Bot. Mag. xvi. 119 (1902).

Flores parvi, circiter 5 mm. longi; carpella glabra; species japonica ... 1. *S. adoxoides.*
Flores satis magni, circiter 1–1·5 cm. longi; carpella pubescentia:
Folia triternata; Am. bor. ... ... 2. *S. Eastwoodiae.*
Folia biternata; sp. asiatica ... ... 3. *S. simulatrix.*
Folia trifoliolata; sp. asiatica ... 4. *S. Henryi.*

1. **Semiaquilegia adoxoides,** Makino, l.c.

Isopyrum adoxoides, DC. Syst. i. 324 (1818). *I. capnoides* Fisch. ex DC. Prodr. i. 48 (1852). *I. japonicum,* Sieb. & Zucc. in Abh. Akad. Muench. iv. ii. 181 (1843).

China. Szechuan: Keou-pa-tana, *Delavay* 18. Kweichow: Pinsa, *Cavalerie* 1344. Kouy-yang, *Bodinier* 2110. Hupeh: Ichang, A. *Henry* 1253 a; without definite locality, *E. H. Wilson* (Veitch Exped.) 151. Kiangsi: Nankangfu, covering the ground in many parts, Apr., *K. D. Reid.* Kiukiang city wall, *Caries* (Herb. Edinb.). Chekiang: *Shearer; Faber* 714; shady and dry waste ground, Mar.-Apr., *H. J. Hickin.* "Chekiang and R. Yangtze," *Maries.* Ningpo, generally in deep shady glens or hill gorges, April. 1877, *H. Hancock* 30; *Schindler* 459 (Herb. Edinb.). Shanghai, *Bodinier* 305.

Japan. Tokyo, *Sakurai* (Herb. Edinb.). Oyama, *Bisset* 1382 (Herb. Edinb.). Nagasaki, *Langsdorff* (Herb. Fischer); *Oldham* 15; on old walls and banks, 500; *Marimouries; A. C. Maingay* 826. Yokoska, *Savatier* 12. Near Kobe, Apr. 1875, *Moseley:*— for further Japanese records see Makino l.c.

Corea. Quelpaert Island, *Taquet* 510, 507, 2569, 4548, 4806, 4807, 4808, 6048; *Faurie* 1724.

Japanese name—*Hime-udu.*

2. **Semiaquilegia Eastwoodiae,*** *nobis,* comb. nov.

Aquilegia micrantha mancosana, Eastw. in Proc. Calif. Acad. iii. i. 77 (1897). *Aquilegia micrantha ecalcarata,* Davis in Minn. Bot. Stud. ii. 336 (1899). *Aquilegia Eastwoodiae,* Rydb. in Bull. Torr. Bot. Club, xxix. 146 (1902). *Aquilegia ecalcarata,* Eastw. in Zoe, ii. 226 (1891); Payson in Contrib. U.S. Nat. Herb. xx.

* This and the next may be as Payson (l.c.) inclines to suggest aberrant forms of *Aquilegia,* but pending further evidence we assume them to be primitive and have placed them in *Semiaquilegia,* to which on the characters they must be referred. Ulbrich's alternative solution to put *S. Henryi* under *Aquilegia* hardly commends itself.

153 (1918). *Aquilegia mancosana*, Cockerell in Torreya, xi. 75 (1911).

North America. Colorado: Johnston Canyon, Mesa Verde National Park, *Eastwood*.

"Miss Eastwood collected this interesting plant in but one niche-like cavern, where the sun never comes and where the supply of water is so slight during the hot, dry summer that it is forced to cling close to the damp rocks, even climbing up the sides of the cave with its slender, threadlike stems."—Payson, l.c. We have not seen a specimen.

3. **Semiaquilegia simulatrix,** *nobis*, nom. nov.

Aquilegia ecalcarata, Maxim. Fl. Tangut. 20, t. 8, fig. 12. (1889); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 411 (1904); non Hort. ex Steud., nec Eastwood.

China. Eastern Kansu, *Przewalski*, *Potanin; Farrer* 280 (spec. cult. by *Mrs. Woodward*, Arley Castle). Szechuan: near Tatsienlu, *Soulié; Bonvalot*.

Fig. 7. Semiaquilegia Henryi. (Nat. size; dissections and fruit enlarged.)

4. **Semiaquilegia Henryi,** *nobis*, comb. nov.

Isopyrum Henryi, Oliv. in Hook. Ic. Pl. t. 1745 (1888). *Anemone Boissiaei*, Lev. et Vaniot in Bull. Acad. Geogr. Bot. 1902, 47. *Aquilegia Henryi*, Finet et Gagnep. in Bull. Soc. Bot.

Fr. li. 411 (1904). *Isopyrum Boissieui*, Ulbr. in Engl. Bot. Jahrb. xxxvi. Beibl. 80, 6 (1905).

China. Hupeh: Nanto and neighbouring mountains, growing out of clefts of rocky cliffs, flower bluish, *A. Henry* 3820. Kweichow: between Tsin-chen and Ganpin, Mar. 17, 1898, *Martin & Bodinier* 2120. Pinsa, *Cavalerie* 864. Chwang Chanpo, *Esquirol* 3145. Szechuan: Tchen-keou district, *Farges*.

Souliea, *Franch.*

Souliea vaginata, *Franch.*, in Journ. de Bot. xii. 69 (1898). *Isopyrum vaginatum*, Maxim. Fl. Tangut. 18, t. 30 (1889).

China. Thibet: Jhangkar Chu valley and up to the Jhangkar Pass, end of May, 1914, *E. H. Walsh* 104. W. Kansu: 1885, *G. N. Potanin.* Szechuan: "chiefly near Tachienlu," *A. E. Pratt* 881; without definite locality, 3000–3450 m., fls. pink, May 1904, *E. H. Wilson* 3171. Yunnan: Santchao, near Moso-yn, *Delavay* 3716.

Fig. 8. Souliea vaginata. (× ¾); dissections enlarged.

The broad sheathing base of the lower petioles is a striking feature of this distinct monotypic genus. In many respects it

appears to provide a definite link between the subtribes *Isopyreae* and *Cimicifugeae*, its correct position being next to *Cimicifuga*. Its fruits (fig. 8) recall those of some species of *Epimedium*, whose dehiscence, however, is by two oblique valves and not by the adaxial (ventral) suture as in *Souliea* and all other dehiscent *Ranunculaceae*.

Index to Names and Synonyms dealt with above.

Anemone Boissiaei, Lev. & Van. = **Semiaquilegia Henryi.**
Aquilegia anemonoides, Willd. = **Paraquilegia grandiflora.**
A. Eastwoodiae, Rydb. = **Semiaquilegia Eastwoodiae.**
A. ecalcarata, Maxim. (non Steud. nec Eastw.) = **Semiaquilegia simulatrix.**
A. ecalcarata, Eastw. = **Semiaquilegia Eastwoodiae.**
A. Henryi, Finet & Gagnep. = **Semiaquilegia Henryi.**
A. micrantha, vars. *mucosum*, Eastw. & *ecalcarata*, Davis = **Semiaquilegia Eastwoodiae.**
Asteropyrum Cavaleriei, *nobis.*
A. peltatum, *nobis.*
Enemion biternatum, *Rafin.*
E. Hallii, *nobis.*
E. occidentale, *nobis.*
E. Raddeanum, *Regel.*
E. stipitatum, *nobis.*
Fontanella tertiaria, Kluk. ex Bess. = **Isopyrum thalictroides.**
Gontarella tertiaria, Gilib. ex Steud. = **Isopyrum thalictroides.**
Helleborus fumarioides, Lamarck = **Leptopyrum fumarioides.**
H. thalictroides, Lamarck = **Isopyrum thalictroides.**
Isopyrum adiantifolium, *Hook. fil. & Thoms.*
I. adoxoides, DC. = **Semiaquilegia adoxoides.**
I. adoxoides, Fr. et Sav. = **Isopyrum nipponicum.**
I. album, Dulac = **Isopyrum thalictroides.**
I. anemonoides, Kar. & Kir. = **Paraquilegia uniflora.**
I. aquilegioides, Linn. (see "nomina excludenda").
I. auriculatum, Franch. in Bull Soc. Bot. Fr. xxxiii. 376 (1886).
I. auriculatum, Franch. in Journ. de Bot. xi. 220 = **Isopyrum Franchetti.**
I. biternatum, Torr & Gray = **Enemion biternatum.**
I. Boissieui, Ulb. = **Paraquilegia Henryi.**
I. caespitosum, Boiss. & Hohen. = **Paraquilegia caespitosa.**
I. capnoides, Fisch. ex DC. = **Semiaquilegia adoxoides.**
I. Cavaleriei, Lev. & Vaniot = **Asteropyrum Cavaleriei.**
I. Clarkii, Kellog. = **Enemion stipitatum.**
I. Dalzielii, *nobis.*
I. Delavayi, Fr. = **Isopyrum auriculatum,** Fr.
I. dicarpon, Miquel.
I. dicarpon, Franch. et Sav. = **Isopyrum stoloniferum.**
I. dicarpon, S. Moore = **Isopyrum trachyspermum.**
I. Fargesii, Franch.
I. Fauriei, Franch.

I. Franchetii, Finet & Gagnep.
I. fumariaefolium, Salisb. = **Leptopyrum fumarioides.**
I. fumarioides, Linn. = **Leptopyrum fumarioides.**
I. grandiflorum, Fisch. ex DC. = **Paraquilegia grandiflora.**
I. grandiflorum, Les. ex Nakai = **Enemion Raddeanum.**
I. Hallii, A. Gray = **Enemion Hallii.**
I. Henryi, Oliv. = **Semiaquilegia Henryi.**
I. japonicum, Sieb. & Zucc. = **Semiaquilegia adoxoides.**
I. Leveillenum, Nakai = **Enemion Raddeanum.**
I. microphyllum, Royle = **Paraquilegia microphylla.**
I. nipponicum, *Franch.*
I. occidentale, Hk. et Arn. = **Enemion occidentale.**
I. peltatum, Franch. = **Asteropyrum peltatum.**
I. Raddeanum, Maxim. = **Enemion Raddeanum.**
I. sibiricum, Krashym. = **Leptopyrum fumarioides.**
I. stipitatum, A. Gray = **Enemion stipitatum.**
I. stipulaceum, Fr. et Savat. = **Isopyrum dicarpon.**
I. stoloniferum, *Maxim.*
I. sutchuenense, *Franch.*
I. thalictrifolium, Gilib. = **Isopyrum thalictroides.**
I. thalictrifolium, Salisb. = **Isopyrum thalictroides.**
I. thalictroides, *Linn.*
I. thalictroides, Short = **Enemion biternatum.**
I. thalictroideum, St. Leger = **Isopyrum thalictroides.**
I. trachyspermum, *Maxim.*
I. tuberosum, Lev. = **Semiaquilegia adoxoides.**
I. uniflorum, Aitch. & Hemsl. = **Paraquilegia uniflora.**
I. vaginatum, Maxim = **Souliea vaginata.**
Leptopyrum fumarioides, *Reichb.*
Olfa thalictrifolia, Bieb. = **Isopyrum thalictroides.**
Paraquilegia caespitosa, *nobis.*
P. grandiflora, *nobis.*
P. microphylla, *nobis.*
P. uniflora, *nobis.*
Semiaquilegia adoxoides, *Makino.*
S. Eastwoodiae, *nobis.*
S. Henryi, *nobis.*
S. simulatrix, *nobis.*
Souliea vaginata, *Franch.*

Excluded Names.

Isopyrum aquilegioides, Bory & Chaub. = **Thalictrum orientale.**
Isopyrum aquilegioides, Linn. = **Aquilegia viscosa.**
I. semipeltatum, Pampan. = **Thalictrum ichangense.**
I. trichophyllum, Lev. = **Thalictrum foeniculaceum.**
I. trifolium, Britton = **Coptis trifolia.**

XXIV.—TRESCO ABBEY GARDENS, SCILLY ISLES.

One of the functions of the Royal Botanic Gardens, Kew, as is well known, is to grow as far as possible the plants representative not only of the British Empire, but also of the world. For the most part these plants have to be grown under glass, and though even under these conditions many exhibit fairly well their natural pecularities of form and their general characteristics, especially when they come from the tropical regions, yet the plants from the subtropical countries, which are not hardy in the open, cannot as a rule be cultvated to show their true value and beauty under glass.

It is the incomparable advantage of botanists and gardeners of Great Britain that they are able to study such plants, native of South Africa, New Zealand, Australia and South America in the two famous gardens of Tresco Abbey in the Scilly Isles and La Mortola in the Riviera.

These two splendid collections of plants, formed by the enterprise and enthusiasm of two remarkable Englishmen, Augustus Smith and Sir Thomas Hanbury, are perhaps not sufficiently known to the botanists and gardeners of the present generation.

British botanists tend to be concerned so much with problems of structure and function that they have but little leisure or inclination to investigate the interesting general features of the vegetation of the Empire, while those whose function it is to deal with the systematic side of the science are so fully occupied that they have but little time left to study as living organisms the plants with which they are so familiar as dried specimens in the herbarium.

This, however, is an omission that is not wholly their own fault, and it would be highly desirable if arrangements could be made so that systematic botanists, more particularly, should pay visits to these two magnificent collections, from time to time, in order to study in the living condition the plants with which their sphere of work has made them familiar, though only as inanimate objects.

A twofold benefit could not fail to be realised by such visits, for, in the first place, the knowledge of the plants as living organisms growing in the open under conditions closely comparable to those of their native countries would teach much of their structure and functions, and possibly also of their powers of variation and adaptation, while in the second place these experts in botanical nomenclature would be able to assist the owners of the collections in maintaining and ensuring the correct naming of their plants. In addition they would without doubt be able to suggest new and interesting subjects for experimental cultivation.

So extensive are the collections both at Tresco Abbey and in the gardens at La Mortola that they offer abundant scope for a permanent botanist and a botanical laboratory, but such a counsel of perfection is obviously beyond the range of a private individual, who has to be busied with the cares of maintenance of his collection in addition to his other duties, and it should rather be considered a duty of the State to provide funds for visiting botanists,

who might be on the staff of the National Botanical Institution at Kew, or the Royal Botanic Gardens, Edinburgh, for the purposes of making careful studies of the collections at Tresco Abbey and La Mortola at different times of the year.

In the case of both these institutions, which may be truly styled Botanic Gardens, a complete and accurately named garden herbarium is required, and also as far as possible drawings and studies should be made of the rare and interesting plants as they come into flower.

At La Mortola, we believe, something has already been done in the direction of making a representative collection, but at Tresco, beyond the fact that valuable additions have been made from time to time to enrich the national herbaria at Kew and at Edinburgh, a local garden herbarium has not yet been established.

Tresco, however, is fortunate in possessing a remarkable collection of drawings of a large number of the interesting plants which have flowered in the gardens. The collection was commenced by Mrs. Le Marchant, sister of Mr. Augustus Smith, and a most beautiful and faithful book of her paintings is carefully preserved at the Abbey.

These drawings were made about the middle of the last century, and represent the plants introduced to Tresco by Mr. Augustus Smith. Many of these plants were sent to him from Kew, while for others he was indebted to correspondents in Australia, New Zealand and South Africa. His remarkable botanical enterprise and keen interest in gardening was continued by his nephew, whom he made his heir, Mr. Thomas Algernon Dorrien-Smith. He succeeded to the Lordship of the Islands in 1872, and before then had taken no particular interest in plants or gardens, but he succeeded by determined effort to acquire a full knowledge of the collections and developed a very keen interest in and genuine love of his plants. On his lamented death in 1918 (*K.B.*, 1918, p. 242), he was succeeded by his son. Major A. A. Dorrien-Smith. He has not only inherited his father's and great uncle's botanical tastes and interests, but has done even more signal service to the science of botany in making expeditions to New Zealand and the Chatham Islands, and to Australia in search of seed and plants for the enrichment of the collections at Tresco. In addition, during his service in the South African War he found odd moments for collecting, and sent home many interesting seeds of Aloes, Gladioli, and other plants for the Tresco Gardens.

Just as the mantle of the uncle has descended on nephew and great-nephew so has the mantle of Mrs. Le Marchant fallen on her great-nieces, and the collection of flower studies which she initiated has been skilfully and beautifully continued by the Misses Dorrien-Smith, the sisters of the present Lord Proprietor. Though much has been done by these ladies, many plants still remain to be figured to complete the record of a botanical garden which comprises so remarkable and unique a collection.

The Mesembryanthemums which grow here with all the vigour that they exhibit in their native country have nearly all been faithfully painted, as has also the extensive collection of Pelargoniums, most of which flourish here in the open and flower almost

throughout the entire year. One species indeed, *P. tomentosum*, grows with such remarkable vigour that it even kills out the common bramble by suffocation!

Something must now be said of the Abbey Gardens as they are at the present day. Augustus Smith was quick to realise that without shelter it was possible to grow very little of interest on a wind-swept spot like Tresco, and when he became Lord Proprietor in the year 1833 he started the planting up of shelter belts of *Pinus insignis*, *P. Pinaster*, *Cupressus macrocarpa*, and *Quercus Ilex*, which soon resulted in the formation of sheltered nooks and corners where choicer subjects could be planted. Thanks to this shelter from the frequent gales, exotic trees such as *Hakea oleifolia*, *Cinnamomum camphora*, *Banksias*, *Metrosideros tomentosa*, *M. robusta*, and many others are now fine and stately specimens 30–40 feet high and covered each year with a profusion of bloom.

In addition to the shelter belts and plantations of wind-resisting trees an extensive rock garden was built up and formed partly out of the natural granite rock of the island and in the sheltered bays many a plant unknown to our Northern Hemisphere has found a home and developed with extraordinary vigour.

In such places may be found a great variety of Aloes which bloom each year, such as *A. arborescens* and several other species enumerated in the Tresco plant list, numerous Agaves and a host of Crassulas, Sedums, and Mesembryanthemums, which, indeed, revel in the chinks and crannies of the exposed rocks. Even in March and April the garden is brilliant with masses of *Mesembryanthemum aurantiacum*, *M. Zeyheri*, *M. productum*, and cushions of the beautiful soft pink M. *crassum*, with magnificent spires of *Aloe Salm-Dyckiana* rising above them.

Of shrubs, some of the more noticeable at the time of my visit in April were *Olearia Gunnii*, and *O. stellulata*, *Agonis flexuosa*, *Echium Callithyrsum* from the Canary Islands, *Isopogon latifolius* from Australia with its great head of dull pink flowers, *Dryandra formosa*, bearing numerous golden "cones" of flowers, *Halleria lucida* some 30 ft. high covered with flowers and *Brachyglottis repanda* with large trusses of white flowers. This forms a large shrub, and though the leaves with their silvery lower surface are exposed to the full force of the wind they do not appear to suffer to any extent, and give a fine effect as a bold evergreen shrub. Other interesting trees that deserve notice are *Cinnamomum camphora*, some 30 ft. high, *Clethra arborea*, *Ficus macrophylla*, some 20 ft. high, grown from seed brought home by Major Dorrien-Smith, and several Acacias, of which *A. longifolia* was being cut in considerable quantities for the London market. Nor must *Olearia semidentata* be forgotten, which with *O. chathamica* was just coming into blossom.

Four species of *Coprosma*, *C. lucida*, *C. Baueri*, *C. grandiflora* and *C. robusta* make interesting evergreen trees. They were in full flower, and trees of both sexes of some of the species are to be found in the collection. *C. Baueri* sets seed regularly which germinate freely where they fall.

Some of the most successful hedge plants at Tresco are *Escallonia macrantha* and Veronicas, *Eugenia apiculata*, Correas and various species of *Pittosporum*, and the low hedges made by the first-mentioned shrubs enable more tender plants to be grown in small sheltered enclosures.

The Tresco Abbey Gardens and plantations fall into three very distinct sections:—

1. The garden proper, which includes the rock garden with a southern aspect. Here are considerable outcrops of granite rock, and it becomes very hot and dry during the summer months. It is in this part of the garden that the Mesembryanthemums, Crassulas and Pelargoniums flourish as in their native home, and in addition, Pimelias, Diosmas, Aloes, Cactoid Euphorbias and Puyas grow without trouble, while such bulbous plants as Sparaxis and Freesias become veritable weeds.

2. Then there is all the higher ground above the garden densely planted with *Cupressus macrocarpa* and *Pinus insignis*, amongst which are numerous sheltered bays and enclosures. Here among the predominant gorse and heather are planted the Acacias—several species, including *A. Baileyana*, *A. longifolia*, and *A. verticilliata*, growing and flowering in luxuriance, their only enemy being the wind. Several species of *Melaleuca*, *Leptospermum* and *Hakea* are also making fine bushes. Trees of particular interest which have been planted in these sheltered hollows and are doing well are *Leucadendron argenteum*, the Cape Silver tree, some 10 ft. high, surrounded by gorse, which probably affords it good protection against the wind and also keeps the soil moist, *Widringtonia Whytei*, the Mlanje Cedar, from Nyasaland, *Callitris Sullivani*, from Australia, *Juniperus bermudiana*, the pencil cedar, *Dacrydium cupressoides* and several species of *Podocarpus* and other interesting exotic conifers. Here also an avenue of the Norfolk Island Pine, *Araucaria excelsa*, has been made. On the shady side of the grass drive these trees are making fine growth, but on the more exposed and sunny side they are not a success.

3. The third section of the grounds embraces the northern slope of the central hill, and on this side in bays and clearings among the trees a considerable collection of Himalayan and Chinese Rhododendrons has been brought together. There are several fine specimens of *R. arboreum* and *R. Aucklandii*, but the most striking and interesting species is *R. Veitchianum*, a splendid bush some 7 ft. high and 7 or 8 ft. through, bearing a profusion of its magnificent sweetly-scented white flowers in mid-April. *R. ponticum* occurs throughout this part of the grounds as an undergrowth and makes an excellent wind break near the ground. It has, however, one drawback, since it seeds so freely that its seedlings tend to cover the ground and choke the smaller species unless constant attention is paid to weeding them out.

A word may be said as to other weeds which are prevalent in the Tresco Gardens. In addition to Freesias, Cinerarias come up everywhere, and Bluebells, several species of Oxalis, *Allium triquetrum* and *Nothoscordium* are pests with which it is almost impossible to cope effectively. The latter plant introduced by some

lover of plants as an interesting addition has proved to be a curse from which the gardens can hardly hope ever to be freed.

It is not necessary now to allude to the Scilly Island industries, such as the Daffodils (*K.B.*, 1913, p. 171) and Potato growing for the English and French markets which have been so successfully initiated and fostered by the successive Lord Proprietors, but reference may be made in conclusion to the possibilities of growing New Zealand Flax as a crop for the production of Fibre, not only on Tresco, but in suitable spots on some of the other islands. Phormium is growing remarkably well on Tresco without any particular attention being paid to it, and though there would not be very many acres available for its cultivation in the Scilly Isles it would appear possible to set up a Flax industry in co-operation with growers in Cornwall, and provide a sufficient quantity of leaves to keep a Cornish Flax mill working throughout the year.

As an example of the suitability of the Scillies for Phormium it is of interest to find that plants of *P. Colensoi*, a species, however, which is not of much value for Flax production, has established itself at the foot of the Western Cliffs on St. Martin's just above the reach of the waves. Two large plants may now be seen which have apparently grown from chance seeds and they are fully exposed to the salt spray. They flower profusely and ripen seeds, and young seedlings are springing up in crevices in the granite cliffs above and around the original plants. This naturalization of *P. Colensoi* serves to show that though at first sight the Islands might not be thought suitable for Phormium, owing to the somewhat dry granitic soil, yet the climatic conditions so much resemble those of New Zealand that the cultivation would appear to offer every prospect of success.

It is not the purpose of this brief article on the remarkable collections in the Tresco Abbey Gardens to enumerate the various plants in detail, its object rather is to point out that in the Scilly Islands, thanks to the enterprise and love of plants displayed by the successive Lord Proprietors, we have within the bounds of Great Britain a Botanic Garden of singular importance and value. For in this favoured spot may be studied the principal features, not only of the temperate regions of New Zealand and her outlying islands, of Australia and of South America, but also a vast number of the characteristic features of the subtropical vegetation of South Africa.

The Tresco Gardens have therefore an exceptional claim to be regarded as an Imperial asset of great importance to the botanists of this country whose work lies with the botanical resources of the British Empire, and it is to be hoped that some provision may be made for linking them more closely in the future with the scientific centre maintained by public funds for the purpose of co-ordinating the work of applying botanical knowledge to practical ends.

A. W. HILL.

XXV.—MISCELLANEOUS NOTES.

Sir H. A. Wickham.—We note with pleasure that the honour of knighthood has been conferred on Mr. H. A. Wickham in recognition of his pioneer work in the establishment of the Rubber Industry in the East.

Sir Edmund Giles Loder, Bart.—Kew has lost a valued correspondent of long standing by the death of Sir Edmund Loder at Leonardslee, Horsham, on April 14th. He will be long remembered as the maker of one of the finest English gardens of the present time. His tastes in horticulture were very comprehensive, and although his interest in late years was probably keenest in rhododendrons and conifers, there was scarcely any phase of gardening with which he was not in active sympathy. In his earlier days he took up the cultivation of Alpines and constructed one of the most elaborate rock gardens in the country for their accommodation. Daffodils and hardy fruits had also been amongst his special interests. Sir Edmund, however, was a good deal more than a successful cultivator. He took a keen interest in botanical problems, and his efforts to get his collections correctly named were untiring. He was also a zoologist, hunter and sportsman. As lately as March 29th he was fishing in the River Tay. He was the eldest son of Sir Robert Loder, Bart., and was born in August, 1849. As his only son, Capt. R. E. Loder, of the Royal Sussex Regiment, died in March, 1917, from wounds received at Gaza, Sir Edmund is succeeded in the baronetcy by his grandson.

Dr. George V. Perez.—We regret to announce the death of Dr. G. V. Perez on February 29th at La Quinta, Santa Ursula, Teneriffe.

Dr. George V. Perez was the son of Dr. Victor Perez, of Orotava, Teneriffe, a distinguished physician who took a great interest in agriculture and horticulture in the Canaries, and in whose honour *Micromeria Perezii* was named. After his father's death he edited a memoir on the Canarian fodder plant "Tagasaste" (*Cytisus palmensis*), which had been prepared by Dr. Victor Perez in collaboration with the French botanist Sagot.

Dr. G. V. Perez from time to time contributed to various horticultural and arboricultural journals articles dealing with Canarian botany, forestry and horticulture; among these may be mentioned an account of an interesting system of dry farming practised in the island of Lanzarote (Bull. Soc. Hortic. France, Jan. 1913). It is, however, chiefly as an enthusiastic investigator of the Canarian flora that his name will be remembered. He cultivated numerous rare Canarian plants in his gardens at Puerta Orotava, Villa Orotava and Santa Ursula, and was instrumental in introducing some of them into cultivation in Europe. It was owing to his indefatigable efforts that the long-lost *Statice arborea* was rediscovered on the face of a precipitous cliff, up which it was hauled by ropes to which hooks were attached (Ann.

Bot. xxii. p. 115). He communicated some of his enthusiasm to other botanists, and generously placed at their disposal the material and information which he had collected. Among scientific papers written at his suggestion or based on his work, the following may be mentioned:—The Statices of the Canaries of the Subsection Nobiles (Ann. Bot. xx. pp. 205, 301); Echiums from the Atlantic Islands (*Kew Bull.* 1914, pp. 116, 265); Tagasaste and Gacia (*Kew Bull.* 1918, p. 21); The Rain Tree of Hierro (*Kew Bull.* 1919, p. 153).

He retained his enthusiasm to the date of his death, and one of his last letters to Kew was concerned with his efforts to rediscover *Echium gentianoides*, a Palma species which has only once been collected. His name is commemorated by *Statice Perezii*, *Echium Perezii* (Bot. Mag. t. 8617) and *Cytisus Perezii*.

T. A. S.

William Tyson.—We record with regret the death of Mr. William Tyson, which occurred at Grahamstown on April 14th, 1920. Though born in Jamaica in 1851, Mr. Tyson belongs essentially to South Africa, where for many years he was an ardent plant collector. As early as 1877 he began collecting near Port Elizabeth, and in subsequent years he made extensive additions to his store, both when on tour with the Superintendent of Woods and Forests and during periods of residence in a number of districts. His field included the Karroo, the Cape Peninsula, East Griqualand, Pondoland, and the district round King William's Town. His collection supplied the material for several new species as well as for the genus *Tysonia*. Some hundreds of the East Griqualand and Pondoland specimens are at Kew, while the Herbarium Normale Austro-Africainae was considerably enriched as a result of his efforts. A record of Mr. Tyson's correspondence with Kew reveals his keen interest in the welfare of the Cape, as is shown by his scheme for tree-planting in the Murraysburg district. In latter years he resided at Port Alfred, and specialised in marine algae, his interest in which prompted a recent visit to the Pondoland coast; he hoped also to increase his phanerogamic collection, but ill-health unfortunately hampered his activities.

Thesium brachystylum.—Through inadvertence the name *Thesium fimbriatum*, A. W. Hill, has been assigned to two different species of the genus, one from Nyasaland, described in *K.B.*, 1910, p. 184, and the other from South Africa, described in *K.B.*, 1915, p. 27. These names have also been published in the Flora of Tropical Africa, VI. pt. 1, p. 422, and the Flora Capensis, V. sect. ii. pt. 1, p. 191. The South African plant has therefore been given the name *T. brachystylum*, A. W. Hill, as it is distingushed by possessing a short style, a character which separates the species from its nearest allies.

A. W. H.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6] [1920

XXVI.—CONTRIBUTIONS TO THE FLORA OF MACEDONIA: III.*

W. B. Turrill.

The following additional contribution to our knowledge of the Macedonian flora is based chiefly on a collection of over 300 specimens made by Mr. L. V. Turner in 1917 and 1918. Nearly 120 species and varieties are here recorded for the first time in this series, and these appear in clarendon type in the systematic list below. Apart from these new records the chief interest of the collection lies in the fact that it was largely made in the eastern part of Macedonia in the neighbourhood of the Rendina Gulf. Very little, if any, botanical collecting had previously been done in this area and consequently considerable additions have been made to the known distribution of Macedonian plants.

The opportunity has been taken of recording some plants which for one reason or another were not included in the first and second contributions, and also of correcting a few errors which were made in the first paper.

Our greatest need at present, so far as the the Macedonian flora is concerned, are collections from the higher mountains, especially from those, such as the Belashika Planina, which probably have an Alpine flora in their highest parts. Help and advice will be most gladly given at Kew to anyone who is likely to have the opportunity of visiting these unexplored collecting grounds.

Mr. Turner has very kindly supplied the following account of the making of his collection:—

"We landed at Salonika early in February, 1917, and spent

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* Parts I. and II. of the present series were published in the *Kew Bulletin*, 8 and 9, 1918, and 3, 1919, respectively.

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some little time at the Karaissi rest camp. The hills round are of crystalline rock, devoid of trees, and sparsely covered with coarse herbage and occasional low growing shrubs — such as the holly oak (*Quercus coccifera*). The occurrence of some tiny flowers, appearing just after the snow melted, aroused my interest and decided me to do what I could in making a collection.

"Apart from the very few collected at Karaissi the specimens were obtained chiefly while at four camps.

"The first of these was Lembet. Our camp was close to the village, on the edge of the Hortiach ridge, leading up to the peak Kotos, and just east of the Seres Road at Kilo. 5. The specimens were obtained during the months of March, April, May, and June from this neighbourhood, including the hilly country between Lembet and Jaladzik (Yellow-jack), and the Happy Valley, which runs approximately parallel to, and east of the Seres Road.

"Early in July we were encamped for some ten days at the great tumulus on the western side of the Seres Road at Kilo. $8\frac{1}{2}$ and near the summit of the Derbend. A few specimens were added there, although I missed a fine white foxglove, many examples of which were in full flower on the pass going towards General's Corner.

"We then trekked along the Langaza-Beshik trough *via* the Rue Ignatia—through the Rendina Gorge with its magnificent vegetation to Stavros.

"My third set of specimens were obtained while at Stavros Point during the very hot months of July, August, and September. Here there is a narrow strip of alluvial land at the foot of the scrub-covered and wooded hills surrounding the Rendina (or Orfano) Gulf.

"Thence we trekked to the Struma front and a few additions were made to the collection during my encampments in the autumn of 1917 to May, 1918, near Ano Krusones. The latter lies almost at the summit (some 1200 ft. above sea level) of the sandy scrub-covered hills which are intersected by steep ravines and overlook the mouth of the Struma, Amphipolis Plateau, the Struma Gorge and Lake Ahinos. Superb and distant views of the Struma Plain and the Belashika Mountains could be obtained on almost any day, while the great peak of Pilav Tepe frowned or smiled on us continually, and away in the distance the graceful peak of Mount Athos rose from the sea on the south-eastern horizon.

"With greater freedom it is probable that a very large number of additional specimens could have been collected. One area of the hill side from Ano down the Brigade Track towards Tasli was covered with a fine bushy species of bell heather, of which I unfortunately obtained no specimen.

"Around here the flowers in the spring were as wonderful as they were reported to be on the great Struma Plain. In my own camp even varieties of fly, bee, and butterfly orchis, anemone, iris, and sweet violet abounded, while in the autumn crocus and cyclamen were equally abundant. Unfortunately during my

stay in this area opportunities for collecting and pressing specimens were few, so that many were omitted."

The two following papers dealing, the first in part, the second entirely, with the flora of Greek Macedonia, have recently appeared: A. G. Ogilvie, "A Contribution to the Geography of Macedonia," Geogr. Journ. Jan. 1920, p. 1. E. Jeanpert, "Enumeration de Plantes de Macedoine," Bull. Mus. Nat. d'Hist. Nat. Paris, 1919, Nos. 5 and 6, pp. 390, 517. Both deal with observations and collections made during the allied occupation, and the publication of the latter paper is not yet completed.

Systematic List.

Clematis Flammula, L. Stavros, in flower and fruit, 8 and 9-17, *Turner*, 202, 233, 247, 259.

Thalictrum angustifolium, Jacq. Stavros, in flower and young fruit, 7-17, *Turner* 204, 205.

Anemone stellata, Lam. Lembet, in flower, 3-17, *Turner* 15; Ano, in flower, 4-17, *Turner* 313.

Anemone blanda, Schott et Kty. Lembet, in flower, 3-17, *Turner* 14.

Adonis aestivalis, *L.*

Struma Plain, 2 km. S.E. of Orljak, in flower and fruit, 23–4–17, *Turrill* 94.

Distr. Cent. and S. Eur., N. Afr., Orient.

Balkans: Greece, Maced., Bulg.

The following probably belong to this species, but the material is not sufficient to decide definitely: Struma Plain and Krusa Balkan, in flower 4 and 5-18, *Harris* 20, 225; Lembet, in flower and young fruit, 5-17, *Turner* 79.

Ranunculus Ficaria, *L.*

Ano, in flower, spring 1918, *Turner* 299.

Distr. Eur., Caucasus, Asia Minor, N. Afr.

Balkans: General.

This is very probably the var. *ficariaeformis*, Fiori (*Ficaria grandiflora*, Robert) but the material is insufficient to determine.

Nigella arvensis, L. Lembet, in flower, 6-17, *Turner* 173.

Delphinium halteratum, S. et S. $8\frac{1}{2}$ km. N. of Salonika, in flower, 7-17, *Turner* 199.

Delphinium peregrinum, *L.*

Lembet, in flower, 7-17, *Turner* 186.

Distr. S.E. Eur., Orient.

Balkans: Greece, Maced.

Delphinium paniculatum, Host. Lembet, in flower, 6–17, *Turner* 142.

Glaucium flavum, *Cr.* (*G. luteum*, Scop.).

Stavros, in flower, 7-17, *Turner* 220.

Distr. Cent. and S. Eur., Canaries, Orient.

Balkans: Greece, Maced.

Glaucium corniculatum, Curt. var. *flaviflorum*, DC. $8\frac{1}{2}$ km. N. of Salonika, in flower and fruit, 7-17, *Turner* 198.

Hypecoum procumbens, *L.*
Lembet, in flower, 3 and 4-17, *Turner* 23a.
Distr. Mediterranean Region.
Balkans: Greece, Bulg.

Hypecoum grandiflorum, Benth. Lembet, in flower 3 and 4-17, *Turner* 23.

Fumaria officinalis, L. Lembet, in flower 3-17, *Turner* 12.

Capparis sicula, *Dub.*
Lembet, in flower, 7-17, *Turner* 190.
Distr. S.E. Eur., Orient.
Balkans: Greece, Maced.

Reseda lutea, *L.*
Lembet, in flower, 4-17, *Turner* 48.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: General.

Reseda alba, *L.*
Lembet, in flower, 6-17, *Turner* 166.
Distr. S. and W. Eur., N. Afr., Orient.
Balkans: Greece.

Viola Kitaibeliana, R. et S. Lembet, in flower 3 and 4-17, *Turner* 26; Kato, in flower, 4–17, *Turner* 291.

Lepidium campestre, *L.*
Lembet, in flower and fruit, 5-17, *Turner* 81.
Distr. Eur., Orient.
Balkans: Greece, Maced., Bulg.

Clypeola jonthlaspi, *L.* var. **intermedia,** *Hal.*
Lembet, in flower and fruit, 4-17, *Turner* 28.
Distr. (of var.). Greece, Smyrna.

Camelina rumelica, *Vel.* (probably the same as *C. microcarpa*, Andrz.).
Struma Plain, 2 km. N.E. of Orljak, in flower and fruit, 26-4-17, *Turrill* 101.
Distr. Maced., Thrace, Bulg.

Raphanus Raphanistrum, *L.*
Lembet, in flower, 4 and 5-17, *Turner* 58.
Distr. Eur., Orient, N. Afr., and more or less spontaneous in many temperate regions.
Balkans: Greece, Maced.

Sisymbrium officinalis, *Scop.*
Lembet, in flower and fruit, 5-17, *Turner* 107.
Distr. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Serb., Bulg.

Lepidium graminifolium, *L.*
Lembet, in flower and fruit, 7-17, *Turner* 187.
Distr. Cent. and S. Eur., Orient.
Balkans: Greece, Maced., Bulg., Thrace.

Aethionema graecum, *Boiss. et Heldr.* var. **pseudogracile,** *Hal.*
Lembet, in flower and young fruit, 4-17, *Turner* 36; Kato, in flower, 4-17, *Turner* 293.
Distr. (of var.). Greece, Epirus, Maced., Bulg.

Capsella grandiflora, *Boiss.*
Ano, in flower, spring 1918, *Turner* 302.
Distr. Greece, Epirus, Corfu, Thessaly.

Capsella thracica, *Vel.*
Lembet, in flower and fruit, 3-17, *Turner* 5, 9.
Distr. Maced., Thrace, Bulg.

Cardamine graecea, L. Ano-Krusones, in flower and young fruit, 4-17, *Turner* 319.
Alyssum micranthum, M.B. Lembet, in flower, 3-17, *Turner* 4.

Erophila verna, *Meyer,* var. **brachycarpa,** *Jord.* (pro. sp.).
Lembet, in flower and young fruit, 3-17, *Turner* 19.
Distr. Cent. Eur., Orient.
Balkans: Greece.

Erysimum repandum, L. Ano, in flower, spring 1918, *Turner* 295.

Berteroa orbiculata, *DC.*
Lembet, yellow flowers, 4-17, *Turner* 27.
Distr. Maced., Thrace.

Berteroa incana, *L.,* var. **stricta,** *Turrill.* (comb. nov.) *Berteroa stricta,* Boiss. et Heldr. *B. orbiculata,* DC. var. *stricta,* Boiss. *B. incana,* DC., var. *trichocarpa,* Rohlena in Mag. Bot. Lap. vi. 1907, p. 151.
Ano, in flower and fruit, spring 1918, *Turner* 307. S.E. of Karamudli, white flowers, in flower and fruit, 20-6-17, *Turrill* 430.
Distr. (of var.). Thessaly, Maced., Thrace, Bulg., Mtn. (prob. also Alb. and Bosnia).

Hypericum olympicum, L. Lembet, in flower, 5 and 6-17, *Turner* 113; Stavros, in flower, 8-17, *Turner* 228.

Hypericum crispum, *L.*
Lembet, in flower, 7-17, *Turner* 181.
Distr. S.E. Eur., Orient.
Balkans: Greece, Maced., Thrace.

Hypericum perforatum, L. Lembet, in flower, 6-17, *Turner* 171.
Velezia rigida, L. Lembet, in flower, 7-17. *Turner* 180.
Dianthus tenuiflorus, Griseb. Lembet, in flower, 5-17, *Turner* 126.

Dianthus gracilis, *Sibth.* var. **armerioides,** *Griseb.*
Lembet, in flower, 6-17, *Turner* 148.
Distr. (of var.). Maced., Bulg. (?).

Dianthus pinifolius, *S. et S.*
Lembet, in flower, 6-17, *Turner* 152.
Distr. Thessaly, Epirus, Maced., Thrace, Bulg., Lemnos.

Kohlrauschia prolifera, Rchb. fil. Stavros, in flower, 7-17, *Turner* 225.

The specimens which flowered at Kew, 15-6-18, and were grown from seed collected on the southern slopes of Krusa Balkan, 30-6-17, *Turrill* (seed-number), 66, are *Kohlrauschia velutina*, Rchb.

Tunica illyrica, Boiss. Lembet, in flower, 6-17, *Turner* 153.

Saponaria officinalis, L. Lembet, in flower, 7-17, *Turner* 183. A form with double flowers.

Saponaria officinalis, *L.* var. **glaberrima,** *Ser.* in DC. Prod. I. p. 365.

Stavros, in flower, 7-17, *Turner* 221.

Distr. (of var.). Here and there with the type.

Silene subconica, Friv. Lembet, in flower 5-17, *Turner* 91.

Silene lydia, *Boiss.* (*S. Harrisii*, Turrill, in *Kew Bull.* 1918. p. 267).

Struma Plain and Northern slopes of Krusa Balkan, in flower, 4 and 5-18; *Harris* 164; Struma Plain, 2 km. S.E. of Orljak, pink flowers, 26-4-17, *Turrill* 103.

Distr. Western Asia Minor.

Silene trinervia, Seb. et Maur. Stavros, in flower, 7-17, *Turner* 218.

Silene gallica, L. Lembet, in flower, 4 and 5-17, *Turner* 52, 61.

Silene graeca, *Boiss. et Sprun.*

Lembet, in flower, 5 and 6-17, *Turner* 112.

Distr. Greece.

Cucubalus bacciferus, *L.*

Stavros, in flower, 7-17, *Turner* 217.

Distr. Cent. and S. Eur., Orient.

Balkans: Maced., Thrace, Bulg.

Agrostemma Githago, L. Lembet, in flower, 5-17, *Turner* 78.

Alsine recurva, *All.*

Lembet, in flower, 5-17, *Turner* 95. Struma Plain and northern slopes of the Krusa Balkan, in flower and fruit, 5-17, *Harris* 307; 8-10 km. N. of Salonika, in flower, 13-4-17, *Turrill* 15.

Distr. Cent. and S. Eur. (generally on mountains).

Balkans: General as far south as Thessaly.

Spergularia diandra, *Guss.*

Lembet, in flower, 5-17, *Turner* 116.

Distr. S. Eur., N. Afr., Orient, N. Asia, Abyssinia.

Balkans: Greece.

Polygala nicaeensis, *Risso*, subsp. **mediterranea,** *Chodat.*

Ano-Krusones, in flower, 4-18, *Turner* 327.

Distr. (of subsp.). Spain, S. Fr., It., S. Tyrol. W. Croatia, Dalm., Thrace, Sicily, Alg., Tunis.

Cistus villosus, L. Lembet, in flower, 5-17, *Turner* 125.

Helianthemum salicifolium, Pers. Lembet, in flower, 3-17, *Turner* 7.

Malva silvestris, L. Lembet, in flower, 5-17, *Turner* 74.

Althaea officinalis, L. Stavros, in flower, 7-17, *Turner* 209.

Althaea cannabina, *L.*
Stavros, in flower and fruit, 9-17, *Turner* 256; Ano, in flower, 9-17, *Turner* 309.
Distr. S. Eur., Orient.
Balkans: Greece (Thessaly, Epirus), Maced., Thrace, Bulg.
Geranium molle, L. Lembet, in flower and young fruit, 3-17, *Turner* 8; Lembet, in flower and young fruit, 5-17, *Turner* 68.
Erodium cicutarium, L'Her. Lembet, in flower, 3 and 4-17, *Turner* 24; Lembet, in flower and fruit, 5-17, *Turner* 94.

Erodium ciconium, *Ait.*
Lembet, in flower and fruit, 5-17, *Turner* 65.
Distr. S. Eur., Orient, N. Afr.
Balkans: Greece, Maced., Thrace.
Linum flavum, L. var. *thracicum*, Griseb. Ano-Krusones, in flower, 4-17, *Turner* 334.
Linum gallicum, L. Lembet, in flower and fruit, 6-17, *Turner* 170.

Linum austriacum, *L.* (?).
Ano-Krusones, in flower, 4-17, *Turner* 298, 321.
Distr. Cent. and S. Eur., Orient.
Balkans: Greece, Maced., Alb., Bulg.
L. austriacum, L. is very closely related to *L. perenne*, L., and in the absence of ripe fruits the identification of the above specimens is tentative.

Linum hirsutum, *L.*
Ano-Krusones, in flower, 4-17, *Turner* 330.
Distr. S.E. Eur., Orient.
Balkans: Maced., Thrace, Bulg., Serb., Alb., Roum.
Linum tenuifolium, L. Ano-Krusones, in flower, 4-18, *Turner* 329.
Peganum Harmala, L. Lembet, in flower, 6-17, *Turner* 168.
Tribulus terrestris, L. Lembet, in flower and fruit, 6-17, *Turner* 144; Stavros, in flower and fruit, 7-17, *Turner* 215.
The indumentum of this plant is variable. *Turner* 144 has stiff bristle-like hairs 1 mm. in length but no dense short white pubescence such as occurs on the fruits of *Turner* 215.
Paliurus Spina Christi, Mill. Stavros, 8-17, *Turner* 240.
Genista depressa, M.B. Lembet, in flower, 5-17, *Turner* 102.
Ononis spinosa, L. Lembet, in flower, 6-17, *Turner* 155.

Trigonella monspeliaca, *L.*
Lembet, in flower, 3-17, *Turner* 6.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: General.
Medicago minima, var. *mollissima*, Koch. Lembet, in flower and fruit, 5-17, *Turner* 70.
Medicago orbicularis, All. Lembet, in flower and fruit, 4 and 5–17, *Turner* 59.
Medicago falcata, L. Lembet, in flower, 6-17, *Turner* 167.
Medicago rigidula, Desr. Lembet, in flower, 3 and 4–17, *Turner* 10, 34.

Melilotus sulcata, *Desf.* var. **segetalis,** *Rouy et Fouc.*
Lembet, in flower, 4 and 7-17, *Turner* 38, 184. 8 to 10 km. N. of Salonika, in flower, 13-4-17, *Turrill* 37.
Distr. (of var.). N.W. Afr., Spain, Corsica, Sardinia, Cent. and S. Italy, Sicily.

Melilotus indica, All. Lembet, in flower, 4-17, *Turner* 41.
Melilotus alba, Desr. Stavros, in flower, 9-17, *Turner* 227.
Trifolium procumbens, L. Lembet, in flower, 5-17, *Turner* 73.
Trifolium resupinatum, L. Lembet, in flower, 5-17, *Turner* 66.
Trifolium stellatum, L. Lembet, in flower, 5-17, *Turner* 77.
Trifolium angustifolium, L. Lembet, in flower, 5-17, *Turner* 82.
Lotus aegeus, Boiss. Lembet, in flower, 6-17, *Turner* 169.

Lotus corniculatus, *L.* var. **stenodon,** *Boiss.*
Stavros, in flower, 9-17, *Turner* 260.
Distr. (of var.). Greece, Maced.

Colutea arborescens, L. Ano, in flower, 5-18, *Turner* 308.
Astragalus sesameus, L. Lembet, in flower, 5-17, *Turner* 97.

Hedysarum coronarium, *L.*
Lembet, in flower, 5-17, *Turner* 131.
Distr. Spain to Greece.
Balkans: Greece.

Onobrychis Caput Galli, *Lam.* var. **depressa,** *Beck.*
Lembet, in flower and fruit, 5-17, *Turner* 93.
Distr. (of var.). Sicily.
This a variety with glabrous fruits.

Onobrychis gracilis, Bess. Lembet, in flower, 5-17, *Turner* 86.
Vicia grandiflora, Scop. Ano, in flower, 4–18, *Turner* 310.
Vicia lathyroides, L. Lembet, in flower, 3–17, *Turner* 18.
Lathyrus Aphaca, L. Ano, *Turner* 296.
Lathyrus satirus, L. Lembet, in flower, 5–17, *Turner* 71.
Lathyrus Cicera, L. Grown from seeds collected near Mirova, 13-6-17, *Turrill* (seed-number) 47. flowered and fruited at Richmond 2-8-19.
Orobus atropurpureus, Desf. Lembet, in flower, 5-17, *Turner* 72.

Cercis Siliquastrum, *L.*
Stavros, 9-17, *Turner* 282.
Distr. S. Eur., Orient.
Balkans: Greece, Maced., Thrace.

Potentilla taurica, *Willd.*
Lembet, in flower, 5-17, *Turner* 110.
Distr. S.E. Eur., Asia Minor, Caucasus.
Balkans: Greece, Maced., Bulg., Thrace (?).

Potentilla hirta, L. Lembet, in flower, 5-17, *Turner* 111.
Agrimonia odorata, Mill. Lembet, in flower and young fruit, 6-17, *Turner* 160.

Poterium rhodopeum, *Vel.*
Lembet, in flower, 5-17, *Turner* 128.
Distr. Maced., Bulg.

Poterium spinosum, *L.*
Stavros, 8-17, *Turner* 234.
Distr. Sardinia to Thrace, Orient.
Balkans: Greece, Maced., Thrace.

Sedum acre, *L.* var. **neglectum,** *Hal.*
Lembet, in flower, 7-17, *Turner* 182.
Distr. S.E. Eur.
Balkans: Greece, Maced.

Lythrum Salicaria, L. Stavros, in flower, 7 and 8-17, *Turner* 211, 258.

The former runs down to Koehne's var. *genuinum*, forma a, subforma dd, which he only records from Germany (Rhine Province). The latter is the variety *tomentosum*, DC. See Koehne in Engler's Pflanzenr. iv. 21. p. 77.

Herniaria incana, *Lam.*
Lembet, in flower, 6-17, *Turner* 150.
Distr. S. Eur., N. Afr., Orient.
Balkans: General.

Ecballium Elaterium, *Rich.*
Lembet, in flower, 6-17, *Turner* 149.
Distr. Medit. Reg. eastwards to Caucasus.
Balkans: Greece, Maced., Bulg., Herz.

Eryngium creticum, *Lam.*
$8\frac{1}{2}$ km. N. of Salonika, in flower, 7-17, *Turner* 201; Stavros, in young fruit, 9-17, *Turner* 281.
Distr. S.E. Eur., Orient, N.E. Afr.
Balkans: Greece, Maced., Thrace.

Bupleurum junceum, *L.*
Lembet, in flower and young fruit, 8-17, *Turner* 212.
Distr. S. Eur.
Balkans: Epirus, Thessaly, Maced., Thrace, Bulg.

Bupleurum Fontanesii, *Guss.* (See Wettstein, Bibl. Bot., Heft 26, p. 57).
Lembet, in flower, 6-17, *Turner* 138; Chalcidice (?), *Tozer* (see *Kew Bull.*, 1920, p. 30).
Distr. S. Ital., Sicily, Sardinia, Balkans, Asia Minor, Palestine, Egypt.
Balkans: Greece, Maced., Thrace, Bulg.

Crithmum maritimum, *L.*
Stavros, near the sea, 8-17, *Turner* 245.
Distr. W. Eur., Medit. Region, N. Afr.
Balkans: Greece, Maced., Thrace.

Tordylium officinalis, L. Lembet, in flower, 5-17, *Turner* 115.

Tordylium Apulum, *L.*
Lembet, in fruit, 5-17, *Turner* 130.
Distr. S. Eur., N. Afr., Asia Minor.
Balkans: Greece, Maced., Thrace, Herz.

Caucalis latifolia, L. Lembet, in flower, 4 and 5-17, *Turner* 54.
Caucalis leptophylla, L. Lembet, in flower and fruit, 5-17, *Turner* 75.

Torilis heterophylla, *Guss.*
Lembet, in flower, 5-17, *Turner* 118.
Distr. S. Eur., Orient.
Balkans: Greece, Thrace, Bulg.

Torilis nodosa, *Gaertn.*
Lembet, in flower, 5-17, *Turner* 63.
Distr. S. and Cent. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Daucus Bocconei, *Guss.* (*D. communis*, Ruoy et Cav., subsp. *Bocconei*, Rouy et Fouc., Fl. de Fr. VII., p. 234; *D. Carota*, L. var. *Bocconei*, Fiori et Beg. in Fiori e Paoletti, Fl. Anal. d'It. II. p. 186).
Stavros, in flower, 7-17, *Turner* 226.
Distr. S. Fr., It., Sic., Istria, Crete, Algeria.
Sambucus Ebulus, L. Stavros, in flower, 8-17, *Turner* 237.

Galium Aparine, *L.*
Lembet, in fruit, 5-17, *Turner* 64.
Distr. Eur., N. Afr., Orient.
Balkans: General.

Sherardia arvensis, *L.*
Lembet, in flower, 4 and 5-17, *Turner* 30, 109.
Distr. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Galium verum, L. Lembet, in flower, 6-17, *Turner* 147; Stavros, in flower, 7-17, *Turner* 213.
Galium Cruciata, Scop. Lembet, in flower, 6-17, *Turner* 140.

Fedia Cornucopiae, *Gaertn.* var. **graciliflora,** (*Fisch. et Mey.*).
Ano-Krusones, in flower, 4-18, *Turner* 324.
Distr. S. Eur., N. Afr.
Balkans: Greece (rare).

Knautia orientalis, L. Lembet, in flower, 5 and 6-17, *Turner* 87, 176.
Scabiosa ucranica, L. Lembet, in flower, 6-17, *Turner* 159.
Callistemma palaestinum, (L.) Heldr. Lembet, in flower, 5 and 6-17, *Turner* 99, 141; Ano-Krusones, in flower, 4-18, *Turner* 331.
A good deal of confusion has existed regarding this plant. Linnaeus described in his Mantissa prima, p. 37 (1767) a plant from Palestine as *Scabiosa palaestina*. In his Mantissa altera, p. 197 (1771), he described another plant from the same country as *Knautia palestina*. The former is rightly placed in the genus *Scabiosa*, but the latter is now placed in the genus *Callistemma*. Sibthorp in his Fl. Graecae Prod. I. p. 83, and Flora Graeca II.

p. 9, tab. 109, transferred *Knautia palaestina*, L. to the genus *Scabiosa* under the name *S. brachiata*. The plant described in the same work, p. 84, and in Flora Graeca II. p. 10, t. 110, as *Scabiosa Sibthorpiana* is generally considered synonymous with *Callistemma palaestina*, Heldr., or a variety of it. Boissier (Fl. Or. III. p. 146, 1875) keeps up the genus *Callistemma* but adopts Sibthorp's specific name, thus making the combination *Callistemma brachiatum*.

Of the specimens quoted above *Turner* 99 consists of small plants of typical *Callistemma palaestinum*, Heldr. (*Scabiosa brachiata*, Sibth.), while *Turner* 141 and 331 represent *Callistemma palaestinum*, var. *Sibthorpianum*, comb. nov. (*Scabiosa Sibthorpiana*, Sibth. Fl. Gr. Prod. I. p. 83 et Fl. Gr. III. p. 10, t. 110).

Achillea clypeolata, S. et S. Lembet, in flower, 5-17, *Turner* 114.

Achillea crithmifolia, W. K. Stavros, in flower, 7-17, *Turner* 208.

Anthemis tinctoria, L. Lembet, in flower, 6-17, *Turner* 156.

Echinops microcephalus, S. et S. Lembet, in flower, 7-17, *Turner* 191.

Carlina lanata, L. $8\frac{1}{2}$ km. N. of Salonika, in flower, 7-17, *Turner* 200.

Xeranthemum annuum, L. Lembet, in flower, 6-17, *Turner* 158.

Artemisia scoparia, *W. K.*
Stavros, in flower, 9-17, *Turner* 262.
Distr. Cent. and E. Eur., Orient, N. and E. Asia.
Balkans: Thessaly, Maced., Bulg.

Matricaria Chamomilla, L. Lembet, in flower, 4-17, *Turner* 50.

Anthemis Triumfetti, *DC.*
Lembet, in flower, 4-17, *Turner* 40, 49.
Distr. S. Eur., Orient.
Balkans: Serb., Herz., Thrace.

Anthemis rigescens, Willd., does not appear to be specifically distinct from this species.

Inula viscosa, *Ait.*
Stavros, in flower, 9-17, *Turner* 263.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced.

Chondrilla juncea, L. Stavros, in flower and fruit, 8-17, *Turner* 231.

Cichorium Intybus, L. var. *glabratum*, Presl. Lembet, in flower 6-17, *Turner* 139.

Scolymus hispanicus, L. Ano, in flower, 1918, *Turner* 306.

Chrysanthemum segetum, L. Lembet, in flower, 4 and 5-17, *Turner* 56.

Chrysanthemum coronarium, *L.*
Lembet, in flower, 4 and 5-17, *Turner* 57.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece.

Filago germanica, *L.*, var. **eriocephala,** *Boiss.*
Lembet, in flower, *Turner* 188.
Distr. (of var.). S. Eur., Orient.
Balkans: Greece.

Xanthium spinosum, L. Lembet, 5-17, *Turner* 100.

Tragopogon (Geropogon) glaber, *L.*
Lembet, in flower, 5-17, *Turner* 96.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece.

Tragopogon porrifolius, L. Lembet, in flower, 5-17, *Turner* 121.

Asteriscus aquaticus, L. Lembet, in flower, 5-17, *Turner* 108.

Diotis maritima, *Sm.*
Stavros, in flower, 8-17, *Turner* 239.
Distr. W. and S. Eur., N. Afr., Orient.
Balkans, Greece, Maced., Thrace.

Centaurea paniculata, *L.* var. **macedonica,** *Griseb.*
Krusa Balkan, in flower, 6 and 7-18, *Harris* 349; Lembet, in flower 6-17, *Turner* 178; $8\frac{1}{2}$ km. N. of Salonika, in flower, 7-17, *Turner* 197.
Distr. Epirus, Thessaly, Maced.
An unfortunate amount of synonymy has grown up round this plant. Grisebach first described it (Spic. Fl. Rumel. II. p. 240) under the name retained here. Nyman (Conspec. Fl. Eur. p. 427) raised it to the rank of a species under the name *C. Grisebachii*, though he also quotes it as a synonym of *C. maculosa*, Lam. (l.c. p. 426). Boissier (Fl. Orient. III., p. 644, places it as a variety (var. *macedonica*) of *C. graeca*, Boiss. et Sprun. non Griseb. Halácsy (in Bull. Herb. Boiss. VI., pp. 594-596) described it as *C. pallidior*, var. *pallidissima*, Hal. *C. macedonica*, Hal. and *C. confusa*, Hal., but in his Consp. Fl. Graec., II., p. 147, he retains the name *C. macedonica* (Griseb.), Hal.

Centaurea sublanata, Boiss. Stavros, in flower, 7-17, *Turner* 219; in flower, 9-17, *Turner* 249.
Centaurea salonitana, Vis. Lembet, in flower, 7-17, *Turner* 193.
Centaurea solstitialis, L. Lembet, in flower, 6-17, *Turner* 136.
Centaurea Calcitrapa, L. Lembet, in bud, 5–17, *Turner* 89; in flower, 6-17, *Turner* 154.

Centaurea diffusa, *Lam.*
Lembet, in bud and flower, 6-17, *Turner* 133, 177.
Distr. S.E. Eur., Orient.
Balkans: Thessaly, Maced., Thrace, Bulg.

Calendula arvensis, *L.*
Lembet, in flower, 3-17, *Turner* 13.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced.

Calendula suffruticosa, *Vahl.*
Lembet, in flower, 4-17, *Turner* 33.
Distr. Spain, S. It., Sicily, Thrace.

I have failed to distinguish this species from *C. Noeana*, Boiss., and *C. fulgida*, Raf.

Pulicaria dysenterica, *Gaertn.*
Stavros, in flower, 7-17, *Turner* 222.
Distr. Eur., N. Afr., Orient.
Balkans: Greece, Thrace, Bulg.

Carduus pycnocephalus, L. Ano, in flower, 1918, *Turner* 294.

Galactites tomentosa, *Moench.*
Lembet, in flower, 6-17, *Turner* 137.
Distr. S. Eur., N. Afr.
Balkans: Greece.

Cirsium creticum, *D'Urv.*
Ano, in flower, spring 1918, *Turner* 305.
Distr. S. Eur., Orient.
Balkans: Greece, Maced.

Cirsium italicum, *DC.*
Stavros, 9-17, *Turner* 253.
Distr. Corsica, Sardinia, Greece, Bithynia.

Tyrimnus leucographus, *Cass.* (*Carduus leucographus*, L.).
Lembet, in flower, 5-17, *Turner* 85; seeds collected between Turica and Kopriva, 30-5-17, flowered at Kew, 15-7-18, *Turrill* (seed number) 22.
Distr. S. Eur., Orient.
Balkans: Greece, Maced., Thrace, Bulg.
This plant, determined from description, was recorded in *Kew Bulletin*, 1918, p. 301, as *Cardus pycnocephalus*, L., var. *cinereus*, Boiss.

Chrysanthemum Myconis, *L.*
Lembet, in flower, 5-17, *Turner* 101.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Alb.

Cardopatium corymbosum, *Pers.*
Lembet, in flower, 7-17, Turner 179.
Distr. S.E. Eur., Orient.
Balkans: Greece, Maced., Thrace.

Lactuca saligna, *L.*
$8\frac{1}{2}$ km. N. of Salonika, 7-17, *Turner* 195.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Launaea mucronata, *Muschler.*
Lembet, in flower, 6-17, *Turner* 176a.
Distr. Egypt, Orient.

Campanula phrygia, Jaub. et Spach. Lembet, in flower, 5-17, *Turner* 80.

The var. *serbica*, Adamović in Allg. Bot. Zeitschr., 1896, p. 118, is doubtfully distinct from the type. *Turner* 80 consists of two plants, one glabrous except in the lower part, the other densely white pubescent up to the receptacles and calyx lobes.

Campanula lingulata, W.K. Lembet, in flower, 5-17, *Turner* 98.

Campanula athoa, Boiss. Stavros, in flower, 7-17, *Turner* 210.

Jasione Heldreichii, Boiss. et Orph. Stavros, in flower, 8-17, *Turner* 232.

Specularia Speculum, A. DC. var. *pubescens*, A. DC. Ano-Krusones, in flower, 4-18, *Turner* 317.

Erica arborea, *L.*
Tasli, in flower, 2-18, *Turner* 314.
Distr. Cent. and S. Eur., N. Afr., N. Asia Minor.
Balkans: Greece, Maced., Thrace.

Cyclamen neapolitanum, Ten. Ano, flowers, 1918, *Turner* 300.

Anagallis coerulea, Schreb. Lembet, in flower, 4-17, *Turner* 45.

Lysimachia punctata, L. Lembet, in flower, 6-17, *Turner* 161.

Samolus Valerandi, *L.*
Lembet, in flower, 6-17, *Turner* 143.
Distr. Nearly cosmopolitan.
Balkans: General.

Plumbago europaea, L. Stavros, in flower, 9-17, *Turner* 248.

Jasminum fruticans, L. Lembet, in flower, 5-17, *Turner* 60.

Fraxinus oxycarpa, *Willd.*, var. **rostrata,** *Rouy.*
Stavros, in fruit, 9-17, *Turner* 271.
Distr. (of var.). S. Eur.
Balkans: Albania.

Cynanchum acutum, *L.*
Lembet, small apparently white flowers, 7-17, *Turner* 192; Stavros, larger pink flowers, 7-17, *Turner* 216; Stavros, leaves only, 9-17, *Turner* 236.
Distr. S. Eur., N. Afr., Orient, N. Asia.
Balkans: Greece, Maced., Thrace, Bulg.

Erythraea Centaurium, L. Lembet, in flower, 6-17, *Turner* 174.

Erythraea tenuiflora, *Hoffm. et Link.*
Stavros, in flower, 8-17, *Turner* 230; south of Karamudli, pink flowers, 15-7-17, *Turrill* 494.
Distr. S. Eur., Orient.
Balkans: Greece, Maced.

Erythraea pulchella, *Fr.*
Lembet, in flower, 6-17, *Turner* 175.
Distr. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Erythraea spicata, *Pers.*
Stavros, pink flowers, 9-17, *Turner* 257.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Bulg.

Heliotropium europaeum, *L.*
Stavros, in flower and fruit, 9-17, *Turner* 264.

Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Bulg.

Heliotropium suaveolens, M.B. Lembet, in flower, 5 and 6-17, *Turner* 119, 164.

Symphytum ottomanum, *Friv.*
Lembet, in flower, 4-17, *Turner* 37.
Distr. Hungary, Greece, Serb., Bulg.

Symphytum bulbosum, *Schimp.*
Ano, in flower, 4-18, *Turner* 318; 8-10 km. N. of Salonika, in flower, 13-4-17, *Turrill* 43.
Distr. Cent. and S. Eur.
Balkans: Greece, Maced.

Borrago officinalis, *L.*
Lembet, in flower, 4-17, *Turner* 44.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece.

Anchusa italica, Retz. Lembet, in flower, 5-17, *Turner* 83.
Anchusa officinalis, L. Lembet, in flower, 6-17, *Turner* 172.

Lycopsis variegata, *L.*
Lembet, in flower, 3 and 4-17, *Turner* 25.
Distr. S.E. Eur., Orient.
Balkans: Greece, Maced.

Alkanna tinctoria, *Tausch.*
Lembet, in flower, 4-17, *Turner* 32.
Distr. S. Eur., N. Afr.
Balkans: Greece, Maced., Bulg.

Myosotis cadmea, Boiss. Lembet, in flower, 3-17, *Turner* 21; Kato, in flower, 4-18, *Turner* 292.
Myosotis collina, Hoffm. Lembet, in flower, 3-17, *Turner* 3, 17; Ano, in flower, spring 1918, *Turner* 297.
Lithospermum apulum, Vahl. Lembet, in flower, 5-17, *Turner* 84.

Onosma echioides, *L.* (*O. tauricum*, Auct. non Pallas).
Ano-Krusones, in flower, 4-18, *Turner* 332.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: General.
The various forms of *Onosma* found in the Balkans require further elucidation, and it has been thought best to retain the Linnean name for the present, using it in a wide sense. The plants listed as *O. taurica*, Pall. in *Kew Bull.* 1918, p. 310, agree with the plants generally placed under this species by European botanists, but all differ from the Crimean plant in having the corollas externally pubescent or puberulous.

Echium italicum, L. Lembet, in flower, 7-17, *Turner* 185.
Echium plantagineum, L. Lembet, in flower, 5-17, *Turner* 76.
Convolvulus tricolor, L. Lembet, in flower, 4 and 5-17, *Turner* 43, 123.

Solanum nigrum, *L.*
Lembet, in flower and fruit, 7-17, *Turner* 189.
Distr. Nearly cosmopolitan.
Balkans: General.

Verbascum sinuatum, *L.*
Lembet, in flower, 6-17, *Turner* 132.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Thrace, Bulg.

Verbascum rigidum, *Boiss. et Heldr.*
Lembet, in flower, 5-17, *Turner* 67.
Distr. Greece, Maced.

Linaria genistaefolia, Mill. Lembet, in flower, 6-17, *Turner* 165.

Linaria Pelisseriana, Mill. Lembet, in flower, 5-17, *Turner* 88.
Digitalis lanata, Ehrh. Lembet, in flower, 6-17, *Turner* 157.

Veronica austriaca, *L.*
Lembet, bright blue flowers, 5-17, *Turner* 92.
Distr. S.E. Eur., Orient.
Balkans: Greece, Maced., Thrace, Bulg.

Veronica Chamaedrys, *L.* var. **rigida,** *Turrill*, var. nov. a planta typica caulibus rigidioribus ramosioribus, foliis petiolatis, pedicellis brevioribus praecipue differt.

Planta biennis, caulibus adscendentibus ramosis rigidis inferne pilis in lineis duabus dispositis instructis superne undique hirsutis. *Folia* oblongo-ovata, 2·5 cm. longa, 2 cm. lata, margine inciso-dentata, pagina superiore leviter hispida vel glabra nervis impressis, inferiore in nervis prominentibus valde hispida; petiolus 5–6 mm. longus. *Inflorescentia* 3–12 cm. longa; bracteae lineari-lanceolatae, 5 mm. longae; pedicelli floriferi 2 mm. longi. *Infructescentia* usque ad 3·4 dm. longa; pedicelli fructiferi 4 mm. longi. *Calyx* 5 mm. longa, sepalis costis extra prominentibus instructis.

In flower and fruit at Kew, 10-7-19. Grown from seeds collected on the southern slopes of the Krusa-Balkan, north of Karamudli, 18-6-17, *Turrill* (seed number) 49.

This plant has not been exactly matched with any plant at Kew and is certainly distinct, at least as a variety, from our common *Veronica Chamaedrys*. A plant mentioned (but without a varietal name) by Velenovsky in his Flora Bulgarica, p. 429, appears to approach it in some characters. His description is incomplete and is as follows: Specimina de m. Rilo forman caule rigidiore pedicellis brevioribus foliis profunde inciso-dentatis sistunt. Cetera cum iis Europae mediae optime conveniunt.

A petiolated variety is described by Willkomm and Lange (in Flora, 1852, p. 262, and in Fl. Hispanica II., p. 602) from Spain and named *procera*, but the other characters do not agree with those shown by our plant.

Veronica Anagallis, L. Lembet, in flower, 5-17, *Turner* 122.
A form with smaller upper leaves than in the type.
Bartsia latifolia, S. et S. Lembet, in flower, 5-17, *Turner* 117.

Odontites serotina, *Rchb.*
Stavros, in flower, 9-17, *Turner* 251.
Distr. Cent. and S.? Eur., Orient, N. Asia.
Balkans: Greece, Maced., Bulg.

Orobanche nana, de Noé, Lembet, blue flowers, 5-17, *Turner* 104.

Vitex Agnus Castus, *L.*
Stavros, in flower, 7-17, *Turner* 214.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Thrace.

Thymus Chaubardi, Boiss. et Heldr. Lembet, in flower, 5-17, *Turner* 124.

Thymus Marschallianus, Willd. Lembet, in flower, 5-17, *Turner* 62.

Micromeria juliana, *L.*
Lembet, in flower, 5-17, *Turner* 129.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Thrace, Alb., Herz.

Mentha rotundifolia, *L.*
Stavros, in flower, 8-17, *Turner* 229.
Distr. Cent. and S. Eur., N. Afr., Bithynia.
Balkans: Greece, Thrace.

Lamium bifidum, *Cyr.*
Ano-Krusones, in flower, 4-18, *Turner* 322.
Distr. S. Eur. from Corsica and Sardinia to Macedonia.
Balkans: Greece, Bulgaria (sub-sp. *balcanicum*, Vel.).

Lamium amplexicaule, L. Lembet, in flower, 3 and 4-17, *Turner* 16, 35.

Mentha Pulegium, L. Stavros, in flower, 7-17, *Turner* 207.

Salvia amplexicaulis, Rchb. Lembet, in flower, 6-17, *Turner* 135.

Salvia clandestina, L. Lembet, in flower, 5-17, *Turner* 20, 69.

Salvia Horminum, L. Lembet, in flower, 4 and 5-17, *Turner* 55.

Mentha longifolia, *Huds.* var. **Sieberi** (*Koch.* pro. sp.) *Hal.* (*Mentha sylvestris*, var. *stenostachya*, Boiss. Fl. Or. IV. p. 543). Stavros, in flower, 7-17, *Turner* 206; Struma Plain and Krusa Balkan, in flower, 6-18, *Harris*, 338; Paprat District, Krusa Balkan, in flower, 6-18, *Russell*, 75; South-east of Karamudli, southern slopes of Krusa Balkan, in flower, 20-7-17, *Turrill*, 422.
Distr. S.E. Eur., Orient.
Balkans: General.

Marrubium peregrinum, L. Lembet, in flower, 6-17, *Turner* 163.

Phlomis pungens, Willd., var. *lasiflora*, Vel. Lembet, in flower, 6-17, *Turner* 134.

Sideritis montana, L. Kato, in flower, 4-18. *Turner* 290: Ano, in flower, spring 1918, *Turner* 304.
Both specimens have smaller flowers than in the typical plant, but the difference is probably directly due to habitat.

Origanum hirtum, *Link.* (*O. heracleoticum*, L.?).
Stavros, in flower, 7-17, *Turner* 203.
Distr. Greece, Maced., Crete, Asia Minor.

Scutellaria albida, L. Lembet, in flower, 7-17, *Turner* 194.
Ajuga Chamaepitys, Schreb. (*A. Chamaepytis*, Ind. Kew.). Lembet, in flower, 5-17, *Turner* 120.
Ajuga genevensis, L. Ano, in flower, 4-18, *Turner* 311.
Teucrium Polium, L. Lembet, in flower, 6-17, *Turner* 151.
Teucrium Chamaedrys, L. Lembet, in flower, 6-17, *Turner* 162.

Plantago Coronopus, *L.*
Stavros, in flower, 9-17, *Turner* 250.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Thrace, Bulg.

Phytolacca americana, *L.*
Stavros, in flower and fruit, 7-17, *Turner* 223, 224.
Distr. A native of N. Amer. now widely spread in the Medit. Region.

Turner 224 has a considerable amount of red colour in the flowers and inflorescence, but it has not been found possible to separate it from the typical plant by any morphological characters.

Amarantus retroflexus, *L.*
Stavros, in flower and fruit, 9-17, *Turner* 268.
Distr. Cent. and S. Eur., N. Afr., Orient, America.
Balkans: Greece, Maced., Bulg.

Gomphrena globosa, *L.*
Stavros, in flower, 9-17, *Turner* 252. "Picked up on the shore."
Distr. Native of the tropics.

Chenopodium opulifolium, *Schrad.*
Stavros, in flower, 8-17, *Turner* 235.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece.

Chenopodium Botrys, L. Stavros, in fruit, 9-17, *Turner* 265.

Chenopodium album, *L.*
Stavros, in flower and fruit, 9-17, *Turner* 266, 267.
Distr. Cosmopolitan.
Balkans: General.

Salsola Kali, *L.*
Stavros, 8-17, *Turner* 238.
Distr. Nearly cosmopolitan.
Balkans: Greece, Maced., Bulg.

Polygonum pulchellum, Lois. $8\frac{1}{2}$ km. N. of Salonika, in flower, 7-17, *Turner* 196.

Polygonum arenaria, *W.K.*
Stavros, in flower, 1917, *Turner* 286; Kato, in flower, 4-18, *Turner* 289; Ano, in flower, 4-18, *Turner* 303.
Distr. S.E. Eur., Caucasus.
Balkans: Greece, Thrace, Bulg.

Euphorbia Peplis, *L.*
Stavros, in flower and fruit, 8-17, *Turner* 243.
Distr. W. and S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Euphorbia falcata, *L.*
Lembet, in flower and fruit, 6-17, *Turner* 145.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Bulg.

Ficus Carica, *L.*
Lembet (young leaves), spring 1917, *Turner* 53.
Distr. S. Eur., N. Afr., Orient.
Balkans: General.

Ulmus campestris, L. Stavros, 9-17, *Turner* 269.

Quercus Ilex, *L.*
Stavros, 9-17, *Turner* 285.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced.

Quercus Ilex, *L.* var. **agrifolia,** *DC.*
Stavros, 9-17, *Turner* 277.
Distr. (of var.). Here and there with type.

Quercus lanuginosa, *Thuill.*
Stavros, 9-17, *Turner* 275.
Distr. S.E. Eur., Caucasus.
Balkans: Greece, Bulg.

Cephalanthera ensifolia, Rich. Ano-Krusones, in flower, 4-18, *Turner* 326.

Ophrys cornuta, Stev. Ano-Krusones, in flower, 4-18, *Turner* 316.

Ophrys atrata, Lindl. Ano-Krusones, in flower, 4-18, *Turner* 315.

Orchis tridentata, *Scop.*, var. **commutata,** *Reichb.*
Ano-Krusones, in flower, 4-18, *Turner* 328.
Distr. (of var.). S.E. Eur., Orient.
Balkans: Greece, Maced.

Iris Reichenbachii, Heuf. Lembet, in flower, 4-17, *Turner* 47.

Romulea bulbocodium, R. et S. Karaissi, in flower, 2-17, *Turner* 2.

Romulea Linaresii, *Parl.*
Ano, in flower, 4-18, *Turner* 333.
Distr. Corsica to Thrace.
Balkans: Greece, Thrace.

Smilax aspera, *L.* var. **mauritanica,** *Desf.*
Stavros, 9-17, *Turner* 273.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Maced.

Ruscus aculeatus, *L.*
Stavros, 9-17, *Turner* 274.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Thrace, Bulg.

Asparagus acutifolius, L. Lembet, 4-17, *Turner* 42.

Asparagus acutifolius, *L.* var. **orientalis,** *Baker.*
Stavros, 9-17, *Turner* 272.
Distr. (of var.). Paros, Palestine.

Allium margaritaceum, S. et S. Lembet, in flower, 6-17, *Turner* 146.

Muscari comosum, Mill. Lembet, in flower, 4-17, *Turner* 46, 51.

Muscari racemosum, L. Lembet, in flower, 3-17, *Turner* 11.

Hyacinthus orientalis, *L.*
Cultivated by *H. Blanchard*, Esq., from a bulb collected in a ruined Bulgar village in Macedonia, in flower, 6-3-20.
Distr. Orient. In cultivation and as a garden escape in most of the southern parts of the Balkans.

Ornithogalum umbellatum, L. Ano-Krusones, in flower, 4-18, *Turner* 323.

Ornithogalum fimbriatum, Willd. Lembet, in flower, 4 and 5-17, *Turner* 39, 103.

Gagea stenopetala, *Reichb.* var. **rumelica,** *Vel.*
Karaissi, in flower, 2-17, *Turner* 1.
Distr. (of var.). S. Bulg.

Colchicum latifolium, *Sibth.*
Stavros, in flower, 9-17, *Turner* 261, 287.
Distr. Greece, Macedonia.

Arum italicum, *Mill.*
Lembet, in flower, 5-17, *Turner* 127.
Distr. S. Eur., N. Afr., Orient.
Balkans: Greece, Bulg.

Cyperus fuscus, *L.*
Stavros, in flower, 8-17, *Turner* 242.
Distr. Cent. and S. Eur., N. Afr., Orient.
Balkans: Greece, Maced., Bulg.

Cynodon Dactylon, Pers. Lembet, in flower, 5-17, *Turner* 106.
Briza maxima, L. Lembet, in flower, 5-17, *Turner* 105.

Phacelurus digitatus, *Griseb.*
Stavros, in flower, 8-17, *Turner* 244.
Distr. Thessaly, Maced., Thrace, Asia Minor.

XXVII.—MACROZANONIA MACROCARPA.

R. A. Rolfe.

Two beautiful winged seeds have been sent to Kew for determination from the Botanic Gardens, Brisbane, by Mr. C. T. White, Government Botanist. One is from a sample obtained by Mr. M. J. Colclough in the Aru Islands, and it is said that they are often picked up on schooners' decks at sea, and when seen in the air have a butterfly-like appearance. The other is from specimens collected by the late Captain F. R. Barton, private secretary to the Lieut.-Governor of New Guinea. These were doubtfully referred to *Bignoniaceae* by the late Mr. F. M. Bailey, Government Botanist, though he remarked that "without further specimens it would only be conjecture to say to what plant they belong." Mr. White adds: "I have also seen the same thing in Papua (Mekoe District), but unfortunately failed to get specimens. The plant is said to be a large climber." The two seeds are identical, and are clearly Cucurbitaceous. They prove on comparison to belong to the plant described by Blume as long ago as 1825, from Javan materials, under the name of *Zanonia macrocarpa*, Blume, which has since been separated from *Zanonia* by Cogniaux, under the name of *Macrozanonia macrocarpa*. As it proves to be of wide distribution, though still very imperfectly known, the following account of its history should prove interesting.

The plant was originally very briefly described by Blume, in 1825, under the name of *Zanonia macrocarpa*, from fruiting materials found on Mt. Parang, Java. The author gave the native name as "Aroy Kitjubung," and created for it the new section, *Alsomitra*, Blume, which he distinguished from *Zanonia* proper by its hemispherical fruit and polyspermous cells. The flowers were not known.

In 1843 the plant appeared under the name of *Alsomitra macrocarpa*, Blume, a mistake for Roemer. The latter author established a genus *Alsomitra*, Blume (also a mistake), including in it *Zanonia* section *Alsomitra*, *Z. macrocarpa* (both wrongly attributed to De Candolle), and seven other species which are evidently not immediately allied to *Z. macrocarpa*. He did not define the genus in any way, and its heterogenous character was subsequently recognised by the authors of the Genera Plantarum, who excluded *Alsomitra macrocarpa*, Roem., as a foreign element, and gave to the remainder clear generic definition, an arrangement which has since been generally accepted.

In 1881 Cogniaux was able to give further details of *Z. macrocarpa*, including its fruit and seeds, though flowers were still lacking, and he then established the sectional name *Macrozanonia* for its reception, rightly pointing out that it was not *Zanonia* section *Alsomitra*, Blume. The character of section *Macrozanonia* was given as "Fructus maximus, hemisphaericus, loculis polyspermis. Semina ovata; ala ampla, tenuissime membranacea, diaphana, lateraliter valde dilatata," while of section *Euzanonia* he wrote, "Fructus parvus, cylindrico-clavatus, loculis 2-spermis. Semina oblonga; ala crassa, basi apiceque dilatata."

He also added the localities, Islands of Batjam, Borneo, Mt. Arfak, in Dutch New Guinea, and the Aru Islands, further materials having been collected by Zollinger, De Vriese, Korthals, and Beccari.

In 1893 Cogniaux gave to *Macrozanonia* the rank of a distinct genus, though he added that the flowers were still unknown, and it was not until thirteen years later that he was able to add these important details. The circumstance is thus described: "J'étais désireux de pouvoir étudier les fleurs du *Zanonia macrocarpa* qui jusqu'ici, à ma connaissance, n'existent encore dans aucun herbier européen. Au printemps dernier, ayant eu l'occasion d'être en rapport avec M. J. J. Smith, conservateur au Jardin botanique de Buitenzorg (Java), je lui exprimai l'ardent désir que j'avais de posséder des fleurs de cette espèce. Ma demande fut accueillie avec la plus grande bienveillance, et sur la fin de juillet, je reçus de M. le Dr. Treub, directeur du Département de l'Agriculture, à Java, une caisse contenant de beaux échantillons fleuris de la plante désirée, ainsi qu'un flacon des fleurs des deux sexes, à divers degrés développement." This material enabled the description of the genus to be completed.

Captain F. R. Barton, private secretary to the Lieut.-Governor of New Guinea, sent seeds of an unknown plant to Mr. F. M. Bailey in 1904 and described them as brown, surrounded by broad transparent wings, the whole giving a horizontal diameter of from 5 to 6 in. It is one of these seeds that has now been sent by Mr. White, and proves to belong to *Macrozanonia macrocarpa*.

In 1906, Mr. E. D. Merrill, of the Philippine Bureau of Science, described *Zanonia philippinensis*, Merrill, from the Lamao Lake district, Mindanao, remarking, "A species evidently related to the Malayan *Zanonia macrocarpa*, Blume, differing from the latter in its cordate leaves, and smaller seeds, which have much wider and somewhat longer wings than in Blume's species." It has since been collected in the Island of Negros, and there are specimens from both localities at Kew, but I am unable to separate them from the Malayan materials.

Lastly, we have the record of Miss L. Gibbs that in the Mt. Arfak district of New Guinea "*Zanonia macrocarpa* is the most conspicuous plant seen along the coast in the lower forest. It obliterates whole trees with dense walls of verdure, while the huge fallen fruits, rotting on the ground, are the most striking objects in the forest. The seeds, with transparent wings about 10 cm. across, often fill the air, lazily borne on the breeze, like great butterflies, for which, indeed, I took them at first in the distance."

The species appears to be widely diffused, from Java and Borneo, to Negros and Mindanao in the Philippines, the Aru Islands in the Moluccas, and both western and eastern New Guinea.

The following are the references:—

Macrozanonia macrocarpa, Cogn. in Bull. Herb. Boiss. i. p. 612 (1893); K. Schum. & Lauterb. Fl. Deutsch. Südsee, p. 589 (1901); Cogn. in Bull. Soc. Bot. Belg. xliii. p. 358 (1906).

Zanonia macrocarpa, Blume, Bijdr. p. 937 (1825); Ser. in DC.

Prodr. iii. p. 299 (1828); G. Don Gen. Syst. iii. p. 4 (1834); Miq. Fl. Ind. Batav. i. pt. 1, p. 683 (1855); Cogn. in DC Monogr. iii. p. 927 (1881); Warb. in Engl. Jahrb. xiii. p. 444 (1891); Gibbs, Dutch N.W. New Guinea, pp. 17, 51, 222 (1917).

Ilsomitra macrocarpa, Roem. Synops. ii. p. 117 (1846).

Bignoniaceae, F. M. Bailey, in Proc. Roy. Soc. Queensl. xviii. p. 2 (1904).

XXVIII.—THE WEST AFRICAN OIL PALM.

(*Elaeis guineensis*, Jacq.).

J. H. Holland.

In the editorial paper on the West African Oil Palm (*K.B.* 1909, p. 47) special importance was attached to the cultivation and development of well marked varieties. The lines on which the experiments should be made were given, the keeping of careful records suggested and from the facts gathered up to that time it was considered clear that prolonged experimental work should be undertaken before any extensive sowings of the seed of a particular variety of the Oil Palm were made. Since that date the subject has been before the Agricultural Departments of the Gold Coast, Nigeria, Federated Malay States, Ceylon, Seychelles, etc. All the known varieties have been tested, more especially in West Africa, the "Soft-shelled nut" (forma *tenera*, Becc.) having been one of the most prominent, and great hopes have been centred in this form because of its convenience for cracking. So far, however, neither *tenera* nor any other variety or form appears to have been found constant in their characters on reproduction. The position was summarised in the *Bulletin* for 1918 (pp. 121–124) and the following particulars are to a large extent a continuation of the records there discussed.

In the Gold Coast Report on the Agricultural Department for 1918, it is stated that "the varieties again suffered badly from beetles and only very small crops of fruit were obtained, and that *(a) "Gamopeley"—trees 2, 4 and 6 gave 11 bunches, containing 2215 nuts weighing 50·11 lb., the fruits being similar to "Abetuntum" [fruit nearly spherical, pericarp black at the apex, red at the base, nut hard: see *K.B.* 1909, p. 40]. *(b) "Diwakakwaka"—the single tree was badly attacked by beetles and no fruits were gathered during the year. *(c) "Lisombe" [the soft-shelled palm, forma *tenera*, Becc.]—trees 1, 2 and 4 gave 14 bunches containing 3200 nuts, weighing 77·26 lb. No. 1 alone gave 9 bunches. The fruits are similar to "Abetuntum." (*d*) "Abefita" [fruit very large, pericarp reddish-white, occasionally streaked with black, nut hard: palm exceedingly scarce: (see *K.B.* l.c.): the white Oil Palm, var. *albescens*, Becc.]—trees 4 and 5 gave 5 bunches containing 654 nuts, weighing 10·8 lb.; one of them gave true nuts, the other resembled "Abepa" [fruit pointed at the apex, pericarp very thin and of a dark-reddish colour, a very hard thick nut (l.c. p. 39): the hard-shelled

* (*a*), (*b*), (*c*) Cameroon varieties.

palm nut or var. *communis*, Chev., forma *dura*, Becc.]. (*e*) "Abetuntum"—trees 3 and 5 gave 16 bunches containing 3821 nuts, weighing 50·22 lb., they were all fairly true to type. (*f*) "Abobobe" [fruit medium size, similar in shape and colour to "Abetuntum," shell of the nut very thin and can easily be cracked with the teeth (see *K.B.* l.c. p. 40): the soft-shelled nut or thin-shelled variety: forma *tenera*, Becc.]—trees 1, 3 and 5 gave 12 bunches containing 1318 nuts weighing 21·32 lb. No. 5 gave true thin-shelled nuts. (*g*) "Abedam" [fruit in shape similar to "Abepa," pericarp yellowish-red, nut very hard, "the false or crazy oil-palm" widely distributed over the colony (l.c. p. 40), forma *fatua*, Becc.]—trees 2, 4 and 5 gave 11 bunches, containing 4472 nuts weighing 61·34 lb.: none of them appear true to type."

The above refers to the Agricultural Station at Aburi and the following report (for 1918) is that for the sub-station at Kibbi (records for 1916, *K.B.* 1918, p. 121)—"The various palms were planted in 1912 and as most of them are now coming into bearing they were numbered in August so that the yield of each palm may be ascertained. In future years therefore the individual yields of each palm will be available and a complete survey of the fruits will be made. The following are the aggregate yields for each variety as planted without discriminating:—"Abetuntum," 22 bunches weighing 95 lb. and 48 lb. clean fruits, average clean fruits per bunch 22 lb. "Abobobe," 67 bunches weighing 374 lb. and 203 lb. clean fruits, average clean fruits per bunch 3 lb. "Abepa," 64 bunches weighing 405 lb. and 225½ lb. clean fruits, average clean fruits per bunch 3·5 lb. Mixed varieties gave 144 bunches weighing 1152 lb. and 652 lb. clean fruits, average clean fruits per bunch 4·5 lb. These yields are not much better than in the previous year."

Apart from the cultivation of any special variety on the Gold Coast, it has been found that the cleaning and thinning for a 5-acre plot—357 naturally grown trees in bearing—and the tilling of the soil for other crops amongst odd palm oil trees left standing at the Peki Blengo Station has resulted in a considerable increase in yield (Report Dept. Agric. 1916, p. 53: *K.B.* 1918, p. 121).

In reference to the cultivation in the Seychelles for 1918 (records for 1916, *K.B.* l.c. p. 122) the Curator of the Botanic Station reports:—"Palm oil seeds of the soft kernel varieties were received from the Director of Agriculture, S. Nigeria, during the year (December). Two parcel posts reached Seychelles after being exactly 4 months in transit. Upon the recommendation of Sir D. Prain small consignments will be tested at first as regards the germinating power of the seeds before larger consignments are secured. The varieties already established in the Colony continue to do well. The eight trees grown at the Botanic Station in poor laterite and obtained from soft-shelled seeds from the Cameroons in 1912 have all flowered. Ripe nuts were obtained from four trees, Nos. 1, 3, 4, 5. Of these trees two turned out true to type, Nos. 3 and 5. Nos. 1 and 4 produced hard-shelled nuts. At the 'Palms' (private estate) out of seven plants of

the soft-shelled variety grown in good alluvial soil, four fruited during the year, Nos. 2, 4, 6 and 12; of these only one produced nuts true to type, No. 6. It is a fine tree, which fruited abundantly this year, four ripe bunches having being secured in November and December. The proportion of kernel to nuts (dry) is as high as 53 per cent. In the hard shelled types the proportion is 13 per cent. In another field set out in 1915 near the hospital bridge there are at present thirteen palms growing in two rows out of which eleven are just coming into bearing, and it remains to be seen early in 1919 how many of these plants from soft-shelled seeds will come true to type. I am indebted to the proprietor of the 'Palms' who in 1918 allowed me to fence in tree No. 6 from which seeds are now being secured and sown. It has been decided on Government land to remove the trees which produce hard-shelled nuts so as to avoid cross pollination of the more valuable soft-shelled plants. It is, however, as yet too early to adopt a general policy as regards this question of selection, because many of the hard-shelled trees grown from soft-shelled seeds seem to produce hitherto larger bunches of fruits yielding larger kernels and more pericarp than the true to type trees. For this reason the whole row of trees at the 'Palms' will be left standing although more than half of them have already been shown to produce hard-shelled nuts. The plants grown from seed obtained from Lagos in 1913 have not yet come into bearing."

The following records from Southern Nigeria are taken from the Annual Reports of the Director of Agriculture for 1917, pp. 8–9 and 1918, p. 14. In a connected form for this Colony they are the first to be published in the *Bulletin* and afford evidence that is particularly valuable as coming from the land of our most important trade source of palm-oil and kernels. As on the Gold Coast the experiments in the cultivation of marked varieties is wisely combined with an enquiry as to the effect of cultivation on wild trees in enclosed areas.

In 1911 seeds of the known varieties of the oil-palm were collected and propagated at all the Agricultural Stations, as it is desirable to ascertain whether any or all of these varieties breed true and which is the most profitable variety to cultivate. The seedlings raised were planted out in small plots and some of them commenced to bear fruit towards the end of 1916. As no other officer was available for this work, the Mycologist commenced at Moor Plantation a preliminary investigation of the botanical and economic characters of the oil palm.

The fruits produced by the three plots of young palms were examined, but they were so small that they only yielded a negligible quantity of pericarp oil and kernels. In the thin shell variety, plot not a single fruit with a thin shell has yet been harvested: all the fruits have typically thick shells. The variety in the third plot is that known to the Ibadan people as "Ope Ifa," it is not to be confused with the "Ope Ifa" or "King Palm" of the Lagos people, it is a thick shell variety, but the kernels occasionally have four instead of three eyes, which is characteristic of the thick shell variety. In the thin shell variety

one and frequently two of the eyes are aborted, occasionally fruits were found to consist of a mass of fibre and without a trace of a nut. A plot planted with palms raised from mixed, unselected nuts, has only one palm which yields nuts with thin shells. Both this plot and the "Ope Ifa" plot has a palm which exhibits freak characters. These small plantings have clearly demonstrated that **the oil palm is not a "fixed" species.**

Fruits were regularly harvested from the one-acre enclosure of wild palms; this enclosure has 44 fruit-bearing palms, only one of which is the thin-shell variety. It is interesting to note that fruit was collected during each month of the year and on 18 different occasions. The total number of bunches collected was 290, which yielded 3652 lb. of fruit. The average yield per tree was thus 6·6 bunches. The average weight of fruit per bunch was 12·25 lb. The weight of the bunches has no value, for this varies enormously in accordance with climatic conditions; during wet weather they absorb a large amount of moisture.

The oil was extracted from the pericarp by the method commonly practised in the Western Provinces, and which is reported to produce what is known commercially as "soft" oil. Briefly described the procedure is as follows:—The fruits are separated from the bunch with the aid of a cutlass, and boiled with water in an iron pot until the pericarp becomes soft. They are then turned into a wooden mortar and beaten with wooden pestles to separate the pericarp from the nuts. The mixture of nuts, oil and fibre which results is put into a circular pit which has its surface lined with hardened clay. Here it is trodden on until any fibrous matter adhering to the nuts is removed. The nuts are picked out, and the fibrous mass remaining is hand squeezed; the fibre being discarded. The oily matter which rises to the surface is boiled to evaporate any water present, after which the oil is ready for market. The method is essentially crude; the amount of oil extracted varies from 5·5 to 7 per cent. of the total weight of the fruits; by means of solvents it is possible to extract oil equivalent to more than 10 per cent. of the weight of the fruits.

Experimental extractions from the small quantities of thin shell fruits available gave from 7·5 to 12·5 per cent. of the total weight as pericarp oil. About 600 thick shell kernels go to the pound, as against 1400 thin shell kernels.

From a large control extraction made under careful supervision the following results were recorded—

Total number of bunches harvested	...	136
Gross weight of bunches	...	2,130 lb.
Weight of fruits	...	1,331 lb.
Average weight of fruits per bunch	...	9·78 lb.
Total yield of pericarp oil	...	10·0 galls.
Equivalent yield per 100 lb. of fruits		120·2 fluid oz. of oil [one gall. = 160 fl. oz.]
Total weight of oil extracted ... 95 lb., i.e. *9·5 lb. to gall.		
Total weight of kernels	...	181 lb.

The weight of oil extracted equals 7·14 per cent. of the fruits

* Farquhar & Thompson ("Oil Palm," p. 23) state that one imperial gallon of cold palm oil weighs 8·2 lb.

treated. From these results it is calculated that the acre of wild palms referred to above yielded 261 lb. of pericarp oil and 497 lb. of kernels.

In 1918 the Director of Agriculture reports: "These investigations were proceeded with as far as circumstances permitted. The yield of fruits, pericarp oil and kernels from the various plots is shown below. The oil was again expressed by the primitive native method, as our efforts to procure an oil press have so far been unsuccessful."

	1 acre enclosure of wild palms.		1 acre of palms planted in 1913 20′×20′.
Number of collections	15	...	12
Number of bunches collected ...	265	...	99
Weight of bunches, lb.	5671	...	2369·5
Weight of fruits in bunches, lb. ...	3370	...	1476
Weight of fruits in bunches, % ...	59·4	...	62·3
Weight of nuts obtained, lb. ...	1871	...	803·1
Weight of nuts in fruits, % ...	55·5	...	55·1
Weight of kernels obtained, lb. ...	396·3	...	175·4
Weight of kernels in nuts, % ...	21·2	...	21·8
Weight of oil obtained, lb.... ...	187·8	...	79·67
Weight of pericarp oil in fruits, %	5·6	...	5·4

A sample of nuts of the "Abepa" variety of the Gold Coast was received at the Museum from Ceylon in June, 1919. In reference to this the Director of Agriculture (letter to Director, Kew, dated 29th May, 1919) states: "Seed of this variety of oil palm was secured by this Department in June, 1915, from the Department of Agriculture, Gold Coast. From the plants raised from this consignment, 3 acres of oil-palms were planted 22 ft. by 22 ft. in November, 1915. The plot has been regularly cultivated with disc harrows. Cow-peas (*Vigna Catiang*) and other leguminous crops were inter-sown and ploughed in from time to time. The Experiment Station is situated in the Dry Zone of the Colony, rain rarely falling in any appreciable quantity between May and October. During the dry season the palms have been under irrigation. The average rainfall at the Experiment Station (Anuradhapura) is 68·66 in. In February, 1918, the palms flowered for the first time, viz., at the age of 2 years and 3 months and in October, 1918, the first collection of fruit was made, when 46 lb. was secured. The young palms are looking extremely healthy and vigorous."

It may be of interest to note that in 1897 a firm of nurserymen in Ceylon were prepared to supply seeds of *Elaeis guineensis* at 10s. per 100 (Queensland Agric. Journ. i. 1897, p. 461).

The cultivation in the Dutch East Indian Possessions (*K.B.* 1918, p. 124) is being rapidly extended. The Director of the Algemeen Proefstation Avros, reports (letter to Director, dated Medan, 27th May, 1919) that in 1918 the total of plantations where the "Oil-palm" is cultivated numbers 22, of which 15 are situated on the East Coast of Sumatra, 6 in Attjeh and one in the western part of Borneo, the total area under cultivation being 2303 hectares with a productive area of 982 hectares. "West

Africa," in the issue for March 27th, 1920, records that "at the beginning of 1919 there were in Eastern Sumatra, 5188 hectares planted with 556,162 trees, of which 306,381 (covering 2723 hectares) were in full production," and "Handelsvereeniging, Amsterdam," mentions (letter to Director, dated Amsterdam, April 10th, 1919) that in Sumatra there were 3730 hectares of Oil-palms under cultivation in properly organised plantations.

The following particulars have recently been received by the Director from Mr. R. Swainson Hall, Cabinda, Portuguese Congo, a region which hitherto has not contributed to the fund of information that has been published in the *Bulletin* from time to time. The pericarp, endocarp and endosperm percentages are based upon the weight of one fruit, which was the weight obtained from an average of several typical fruits from each variety. The percentages of oil and kernels are based upon the weight of bunch when freshly cut. It is proposed to undertake experiments in the pollination of the thin-shelled variety—"Bissombe" of the Portuguese Congo and the results will be awaited with much interest.

The varieties of the Oil-Palm, so far noted existing in the Portuguese Congo, together with their native names, are as follows:—

(1) *Elaeis guineensis*, Jacq. var. *microsperma*, Welw. (Fl. Trop. Africa, viii. (1902) x); forma *tenera*, Becc.. or *Kew Bull.* 1914, No. 8, 287, var. *communis*, Chev., forma *tenera*, Becc. Thin shell which can easily be cracked with the teeth. Fruits large and oblong, very fleshy pericarp, soft thin shell, weight of one average fruit, 14·95 grams.

Analysis.—Fleshy pericarp forms 80·6 % of fruit.
,, endocarp ,, 10·7 % ,,
,, endosperm ,, 8·7 % ,,
Oil ... ... ,, 12·25 % ,,
Kernels ... ,, 10·2 % ,,

The native name in the Portuguese Congo for this variety is "Bissombe." This palm does not appear to be very plentiful here.

(2) *Elaeis guineensis*, Jacq., var. *macrosperma*, Welw. (Aponts. p. 584) or var. *communis*, Chev. *Kew Bull.* 1914, p. 286, forma *dura*, Becc. Hard thick shell. Common variety palm. Weight of one average fruit, 16·1 grams.

Analysis.—Fleshy pericarp forms 54·3 % of fruit.
,, endocarp ,, 37·0 % ,,
,, endosperm ,, 8·7 % ,,
Oil ... ... ,, 9·07 % ,,
Kernels ... ,, 7·9 % ,,

Native name, "Peepiti." This palm is plentiful.

(3) *Elaeis guineensis*, Jacq. var. *repanda*, Becc. Chev. (l.c. p. 61) a variety with green tinted fruits, when young and unripe all green, but when ripe green at tips only. Weight of one average fruit, 18·2 grams.

Analysis.—Fleshy pericarp forms 50·0 % of fruit.
,, endocarp ,, 38·0 % ,,
,, endosperm ,, 12·0 % ,,
Oil ... ... ,, 5·25 % ,,
Kernels ... ,, 6·09 % ,,

Native name, "Matuundaby." This palm appears to be very rare here, the natives do not use the oil, as it is said to be a "fetish."

Another instance recently brought into notice of uncertainty in reproduction lies in the variety with the fleshy perianth, known as "Ayara Mbana" in Old Calabar, *"Agode" or "Klude" of Togoland (*Elaeis guineensis*, var. C. H. Wright in *K.B.* 1913, p. 92, with fig. of fruit, and 1919, p. 238. *E.g.* sub-sp. *nigrescens* var. *Poissonii*, A. Chev. *E. Poissonii*, Annet). From a sowing made by Dr. Gruner (Togoland) in 1905 of 61 seeds of "Klude," 51 palms were raised which bore "Klude" fruits and 10 palms which bore fruits of "Dento" or the ordinary variety.

It may be early to generalise or to draw any conclusions as to the prospects under cultivation. Everything, however, at the moment, tends to the advisability that not only experiments in pollination and development of particular varieties on the lines indicated, but that selection on lines similar to those recommended for the "Coco-nut" (see *K.B.* 1915, pp. 72–76) should also be advanced in every possible way. If either of these palms could be raised from suckers in the same way as the "Date Palm" there would be quite a different story to tell in the fixing of varieties and no shadow of disappointment when the time came to gather the crops.

XXIX.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XCVIII.

971. **Malus toringoides,** *Hughes* [Rosaceae-Pomeae]; affinis *M. transitoriae*, Schneider, sed foliis majoribus ad 8 cm. longis minus profunde lobatis interdum indivisis elliptico-oblongis crenato-serratis vel lobulatis, floribus et fructibus multo majoribus, calycis tubo more generis.

Frutex vel *arbor* 3–8 m. alta. *Rami* patentes, leviter penduli, infimi prope terram orti, purpureo- vel brunneo-fusci, praeter novellos araneoso-villosos glabri vel glabrescentes: gemmae parvae, ovatae, acutae, sparse lanuginosae. *Folia* decidua, ad 8 cm. longa, profunde lobata, ambitu ovata vel ovato-elliptica, crenato-serrata, rarius indivisa et tunc elliptico-oblonga, basi attenuata, supra viridia, subtus pallidiora, ad nervos pubescentia, caeterum glabrescentia; petioli supra leviter canaliculati, 1–3 cm. longi, araneoso-villosi. *Flores* in fasciculis vel corymbis subsessilibus 3–6-floris. *Calycis* lobi elongato-triangulares, acuminati, circiter 4 mm. longi, basi 2 mm. lati, tubo breviores, utrinque ut tubus dense tomentosi. *Petala* late ovalia, obtusa, parce subcrenulata, breviter unguiculata, 0·9–1 cm. longa,

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* "Agode" or "Klude" was attributed in *Kew Bulletin*, 1914, p. 288, to var. *idolatrica*, Becc. because it had been described as the "Sacred Palm" of Togoland (*K.B.* 1909, p. 43); but in view of Mr. Wright's note (*K.B.* 1919, p. 238) there seems to be more than one "fetish" palm in West Africa.

3–3·5 mm. lata, intus apice sparse pubescentia. *Stamina* circiter 20, petalis quarta parte breviora. *Styli* 3, staminibus superati, ad vel supra medium connati, glabri. *Ovula* in quoque loculo 2-nata, subcollateralia. *Fructus* maturus globosus vel obovatus, basi leviter attenuatus, apice depressus, cicatrice annuliformi calycis decidui notatus, 1–1·4 cm. diametro, flavus vel in latere ad solem spectante coccineus. *Semina* triangulari-obovoidea, 7–8 mm. longa, 3 mm. lata, pallida. *M. transitoria*, Schneider, var. *toringoides*, Rehd. in Sargent, Pl. Wilson. ii, 286; *Pyrus transitoria* var. *toringoides*, Osborn in Garden, Nov. 1, 1919, 522, with fig. of fruit.

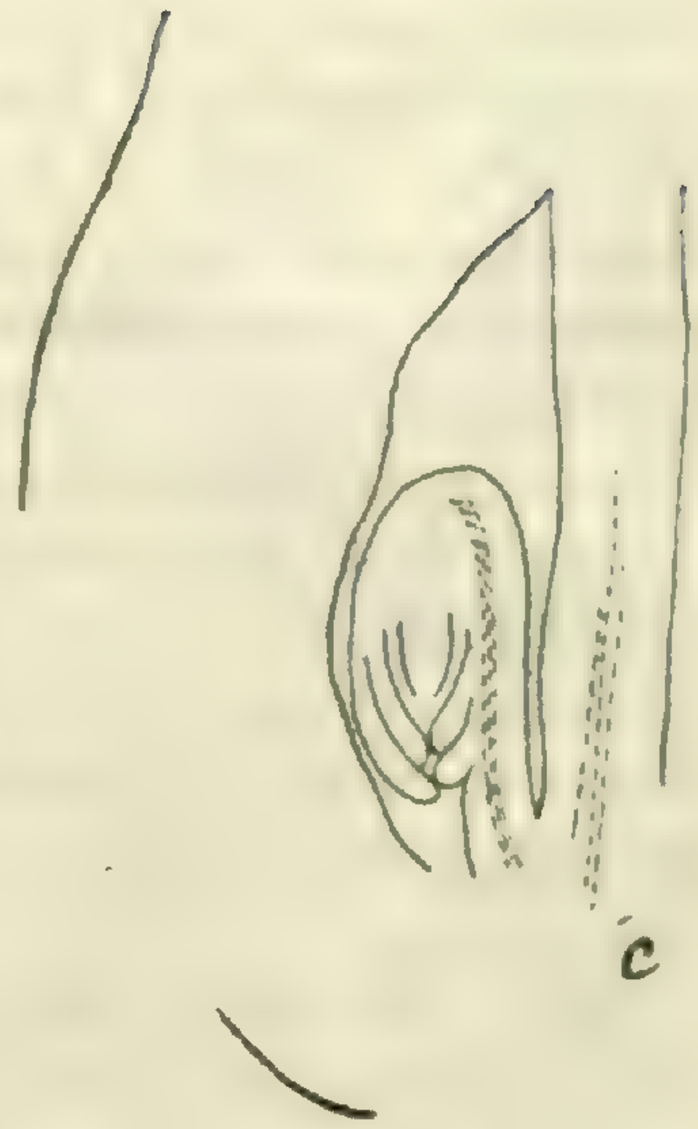
Western Szech'uan. West of Tachien-lu; 3300–3600 m., October, 1908, *Wilson* 1285; near Tongolo, West of Tachien-lu, 3000–3600 m. June to October, 1904, *Wilson* 3494, and Seed No. 1730.

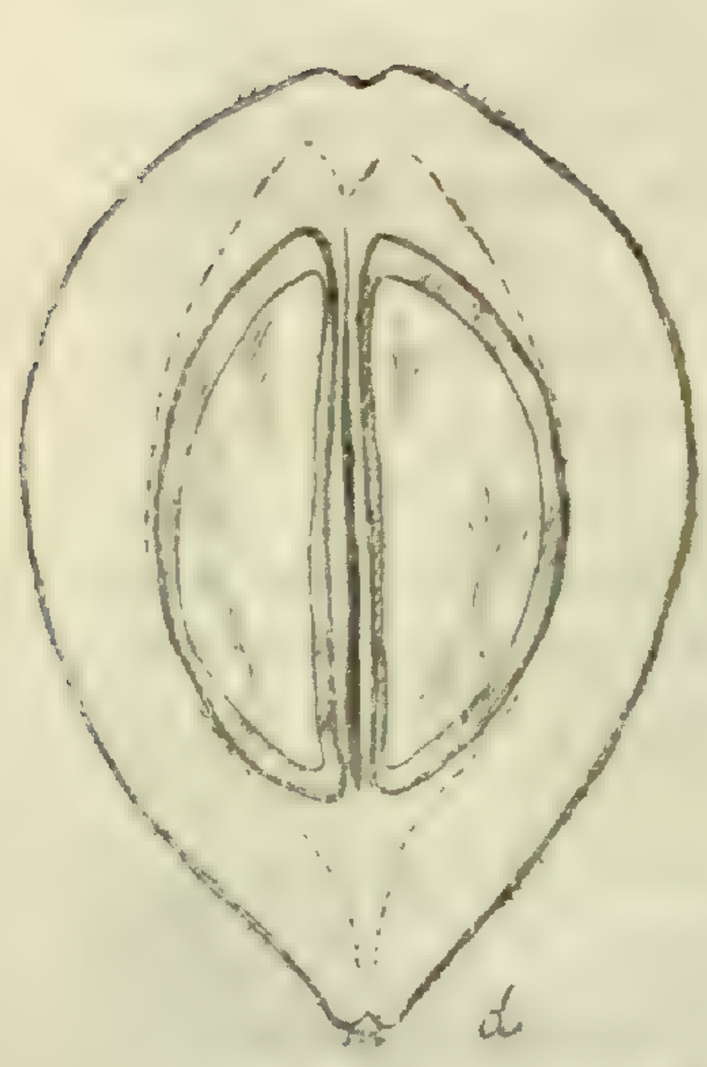
Rehder in Sargent, Pl. Wilson. ii, 286, says: "This plant looks quite distinct from typical *M. transitoria* with its larger, partly entire leaves and larger fruit, and may turn out to be a distinct species, but as long as we do not know the mature fruits of the type and the flowers of this variety, we must rely on the difference in the leaves which are not sufficient for specific separation, as intergradations seem to exist." Flowering and fruiting specimens from Wilson's collection and fresh material from a plant grown at Kew (*Wilson*, seed no. 1730) being now available, it is quite evident that Rehder's suggestion of *M. transitoria* var. *toringoides* being a distinct species is correct.

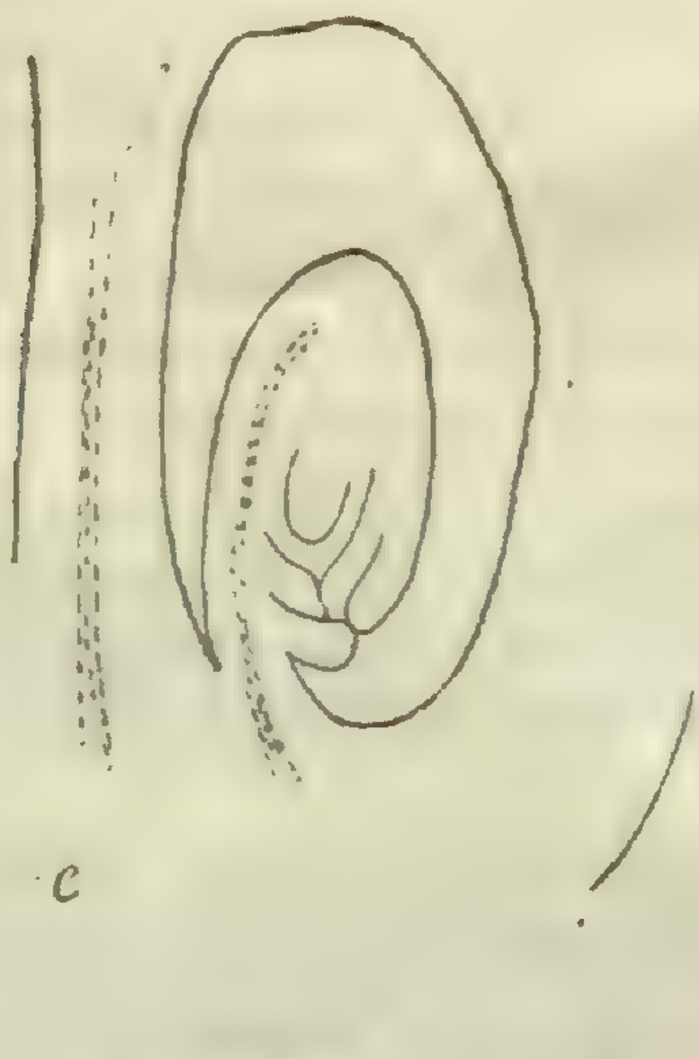
In examining *M. transitoria*, Schneider, a peculiar condition has been observed in the structure of the receptacle. It consists in the separation of an outer portion extending from the calyx lobes to the base of the receptacle so that a cavity is formed between it and the remaining inner parts. The outer portion consists of the epidermis and the parenchyma immediately beneath as far as it contains chlorophyll. It is probably owing to some differentiation in the character of the cell-walls of the zone in question that the separation takes place. It becomes of course more manifest in the dried state. Whether this is a normal process which is eventually obliterated during maturation cannot be decided from the material available. The fruits at hand show at any rate no traces of a temporary disconnection of the chlorophyll bearing layer from the remainder of the fruit and the peculiarity described can therefore in the present state of our knowledge not be used as a diagnostic character, nor does it seem to throw any light on the problem of the morphological nature of the receptacle of *Pomaceae*.

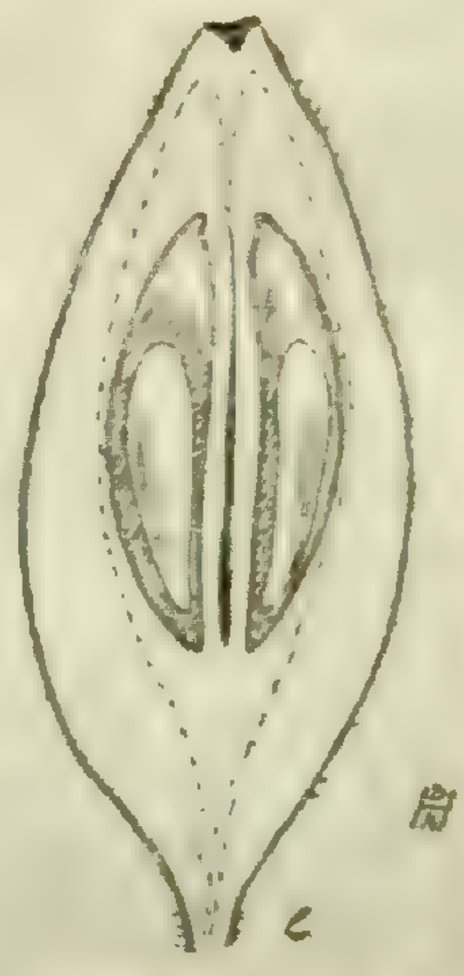
972. **Leptodermis Parkeri**, *Dunn* [Rubiaceae-Paederieae] a *L. lanceolata*, Wall., nervis foliorum 4–5-paribus, floribus 2 cm. longis extus puberulis, seminis testa adnata distincta.

Frutex mediocris, praeter flores glaber. *Folia* sessilia, lanceolata, apice basique acuminata, 2–3 cm. longa, papyracea, nervis lateralibus 4 (–5) paribus infra vix prominulis. *Flores* praecoces, in ramulorum apicibus saepius terni, sessiles, basi bracteis binis involucralibus coriaceis apiculatis arcte cincti. *Calyx* ovoideus,









A. *M. transitoria*, Schneider; B. *M. toringoides*, Hughes; *a*, longitudinal section of the receptacle, 6×; *b*, petal, 6×; *c*, longitudinal section of an ovule, 30×; *d*, mature fruit, 3×; *e*, immature fruit, 3×.

5-lobus, lobis ovatis obtusis breviter fimbriatis. *Corolla* delabens alba (haud rubescens), infundibuliformis, extus puberula, 1·9 cm. longa, tubo et fauce introrsum pilosis, limbo 5-loba 1·2 cm. lato, lobis ovatis. *Stamina* 4, medio tubi inserta, inclusa. *Stylus* filiformis, apice 2–3 (–5)-fidus, stamina subaequans. *Ovarium* 5-loculare, loculis 1-ovulatis, ovulis anatropis erectis. *Fructus* obovatus, calyce discoque coronatus, siccus, loculicide 5-valvis; epicarpium a calyce solutum, pergamaceum; endocarpium fibrosum, semini arcte adnatum.

Punjab Himalaya. Chamba State: in forest undergrowth at Ilndhu Kothi; Belj valley at 7000 feet, 21.6.1919; Kainthli Reserve, Dalhousie Range at 6500 feet, 22.11.1919. *R. N. Parker.* Mr. Drummond tells me that it is frequent in and about the station of Dalhousie.

973. **Strobilanthes aborensis,** *Dunn* [Acanthaceae-Ruellieae] a *S. secundo*, T. Anders., foliis acuminatis basi rotundatis distat.

Caules 2 m. alti, inferne glabri; rami, ut pedunculi et calyces, breviter glanduloso-puberuli, nodis incrassatis. *Folia* lanceolata, acuminata, basi rotundata, obscure crenata, sessilia, 6–14 cm. longa, cystolithis punctiformibus tecta, glabra, venis 6–7 subtus prominulis. *Flores* laxe paniculati, in paria opposita sessilia dispositi; bracteae ovatae, 6 mm. longae. *Calyx* fere ad basin fissus, laciniis linearibus acutis. *Corolla* pallide lilacina, praeter pilos paucos albos internos glabra, tubulosa, 3·5 cm. longa, basi 2–3 mm. lata, supra medium inflata 1 cm. lata; lobi 5, rotundati, 4 mm. longi. *Stamina* 4. *Ovarium*, 4-ovulatum. *Capsula* oblanceolata, 1·5 cm. longa. *Semina* 4, rugulosa, glabra.

Eastern Himalaya. Outer Abor Hills: Makum; 140 m., also plentiful at Sadiya, Kobo, Rotung, Rengging and Yambung Flowers in November. *Burkill* 35757.

974. **Strobilanthes Burkilli,** *Dunn* [Acanthaceae-Ruellieae] a *S. geniculato*, C. B. Clarke, bracteis ante anthesin caducis distat.

Frutex parvus, praeter flores glaber, ramis crebre geniculatis. *Folia* superiora oblongo-lanceolata, acuminata, basi obtusa, obliqua, 6–9 cm. longa, breviter dentato-serrata, subsessilia, cystolithis linearibus tecta, venis 6-paribus infra prominulis. *Flores* 1–4-ni, capitata. *Capitula* graciliter pedunculata, bracteis lanceolatis 1 cm. longis membranaceis glabris ante anthesin caducis cicatrices parvas conspicuas relinquentibus; pedunculi 2–5 cm. longi. *Calyx* ad basin fissus. laciniis linearibus 7 mm. longis ut capsulis breviter glanduloso-pubescentibus. *Corolla* tubulosa, 3–4 cm. longa, basi 2–3 mm. diametro saepe paulo torta, supra medium inflata, 1 cm. lata, cucullata, pallide violacea; lobi 5, rotundati, 2–3 mm. longi. *Stamina* 4. *Ovarium* 4-ovulatum. *Capsula* oblanceolata, 1·3 cm. longa. *Semina* 2, rugulosa, glabra.

Eastern Himalaya. Outer Abor Hills; between Kobo and Pasighat. Flowers in December. *Burkill* 37107.

Mr. Burkill states that this species is found on the gravels of the plains and only just reaches the hills at the place indicated.

The description of the flowers is drawn up largely from his notes made on the spot at the time of collection.

975. **Strobilanthes tenax,** *Dunn* [Acanthaceae-Ruellieae] a *S. secundo*, T. Anders., paniculis glutinosis foliisque acute serratis distat.

Caules supra ut paniculi calyces et capsulae glanduloso-hirti, infra glabri. *Folia* lanceolata, acuminata, basi acuta, 8–10 cm. longa, crebre acute serrata, inferiora breviter petiolata, suprema sessilia, glabra, cystolithis linearibus tecta, venis 6-paribus infra prominulis. *Flores* laxe paniculati, in paria opposita sessilia dispositi; bracteae parvae, lineares, foliaceae, persistentes. *Calyx* ad basin fissus, 1 cm. longus, laciniis linearibus acutis. *Corolla* tubulosa, 3 cm. longa, basi 3–4 mm. diametro, supra medium inflata, 1 cm. lata; lobi 5, rotundati, patentes, 1–2 mm. longi. *Stamina* 4. *Ovarium* 4-ovulatum. *Capsula* oblanceolata, 1·5 cm. longa. *Semina* 2.

Eastern Himalaya. Outer Abor Hills: Kobo; 140 m. Flowers in March. *Burkill* 36785.

976. **Elatostema arcuans,** *Dunn* [Urticaceae-Procrideae] ab *E. platyphyllo*, Wedd., foliis membranaceis distans.

Herba magna, glabra, dioica. *Caules* multi, aggregati, carnosi, virides, striati, arcuantes, apice horizontales. *Folia* alterna, oblanceolata, acuminata, basi obliqua, obtusa vel acuta, parte superiore dentato-serrata, membranacea, cystolithis brevibus tecta, 15–25 cm. longa; stipulae lineari-lanceolatae, deciduae. *Capitula* ♀ (solum visa) fere sessillia, axillaria, hemisphaerica, paulo lobata, 1–2 cm. diametro. *Flores* numerosissimi, virides, breviter pedicellati. *Perigonium* 4-phyllum; segmenta ovata, obtusa, membranacea. *Achaenium* erectum, ovale, striatum, 0·5 mm. longum, perigonium patens bis excedens.

Eastern Himalaya. Outer Abor Hills: growing by water courses near Rotung; 450 m., flowering in December. *Burkill* 37365.

977. **Elatostema imbricans,** *Dunn* [Urticaceae-Procrideae] ab *E. surculoso*, Wight foliis oblongis regulariter imbricatis distat.

Herba parva, glabra. *Caulis* erectus, saepe ramosus, basi radicans, minute brunneo-furfuraceus. *Folia* alterna, imbricata, sessilia, oblonga, apice serraturis 5 prorsum directis notata, basi oblique cordata, 2–2·5 cm. longa, 6–7 mm. lata, trinervia, cystolithis linearibus crebre tecta et dense marginata. *Capitula* ♂ (solum visa) axillaria, sessilia, 3 mm. diametro; bracteae lineari-lanceolatae, scariosae, supra capitula et secus folia subtendentia arcuatae. *Flores* 2–4-ni, subsessiles, 1–2 mm. diametro involucro 4–5-phyllo inclusi; bracteae ovatae, 1–1·5 mm. longae, viridi-costatae. *Perianthii* segmenta 4, hyalina, ovata. *Stamina* 4, inflexa.

Eastern Himalaya. Outer Abor Hills: on the summit of Bapu; 2100 m., and on a "razor edge" ridge dividing the Lalik from the Serpo at 1700 m., in both cases on rocks where the ground is dry and the air very damp. *Burkill* 36364, 36938.

978. **Elatostema MacIntyrei,** *Dunn* [Urticaceae-Procrideae] ab *E. sesquifolio*, Hassk., foliis crenato-serratis, receptaculisque pedicellatis aggregatis distans.

Frutex parvus, praeter novellos glabrus, dioicus. *Ramuli* ut paginae foliorum superiores et involucri bracteae cystolithis linearibus dense tecti, striati. *Folia* alterna, oblique ovato-caudata, basi obtusa, 10–14 cm. longa, 4–5 cm. lata, parte superiore crenato-serrata, chartacea; petioli 0·5–1 cm. longi; stipulae triangulares, caudatae, basi latae, 1–2 cm. longae, deciduae. *Capitula* ♂ (solum visa) axillaria, 8–10-na, 6–8-flora, 1–2 mm. diametro; bracteae cucullatae, dorso calloso-gibbosae; pedunculi 3–5 mm. longi. *Flores* subsessiles, 1 mm. diametro. *Perigonii* segmenta 4, ovata, paulo cucullata. *Stamina* 4.

Eastern Himalaya. Outer Abor Hills; Rengging. Flowers in February. *Burkill* 36734.

At Mr. Burkill's request this species is dedicated to Major-General Donald Charles Frederick MacIntyre, C.B., Indian Army (Retired List), who will be pleasantly remembered by those who took part in the expedition on which the plant was collected.

979. **Andrachne emicans,** *Dunn* [Euphorbiaceae-Phyllantheae] ab *A. Clarkei*, Hook. f., foliis longe petiolatis, floribus fasciculatis differt.

Frutex parvus, glaber, ramos novellos steriles erectos ad 3 m. altos emittens, corpusculis clavatis in axillis aggregatis. *Folia* lanceolata, apice acuminata, basi acuta, 6–9 cm. longa, fusce virentia; nervi laterales, 8–9-pares; petioli graciles, 1–2 cm. longi. *Flores* ♀ (solum visi) axillares, 2–4-ni; pedicelli graciles, 0·9–1·1 cm. longi. *Sepala* 5, ovalia, obtusa, herbacea, 2 mm. longa. *Glandulae disci* cum sepalis alternae, ovatae, profunde bilobae, 0·5 mm. longae, membranaceae. *Ovarium* triloculare, 6-ovulatum. *Styli* 4–6, 0·5 mm. longi. *Capsula* depresse globosa, 0·5–0·6 mm. diametro. *Semina* 6, angulata, 1·5 mm. longa.

Eastern Himalaya. Outer Abor Hills: Kobo; river bank, fruiting in December. *Burkill* 35955, 37068, 37390.

The young shoots springing up to a height of 10 feet make this a notable plant in the jungle.

980. **Smithiella,** *Dunn* [Urticaceae-Procrideae] ab *Achudemia*, Bl., inflorescentia spicata unilaterali differt.

Flores dioici; ♀ minuti, in uno latere spicae longae gracilis liguliformis cum sterilibus glomerati. *Perianthium* 5-partitum, segmentis fere aequalibus. *Staminodia* 5, minuta, globosa, segmentis opposita. *Ovarium* angustum; stigma sessile, fasciculo pilorum radiantium formatum; ovulum e basi erectum. *Achaenium* erectum, compressum, perianthio persistente patente suffultum; pericarpium chartaceum. *Semen* erectum, testa membranacea; albumen tenue; cotyledones late ovati.

Herbae repentes. Folia opposita, petiolata, saepius aequalia, dentata, 3-nervia; stipulae intrapetiolares, deciduae. Spicae terminales.

S. myriantha, *Dunn*, species unica.

Herba viridissima, repens. *Caules* ascendentes, 30–50 cm. longi, basi radicantes. *Folia* late ovalia, apice breviter acuminata, basi obtusa, serrato-dentata, 13–15 cm. longa, 6–10 cm. lata, saepe aequilateralia, glandulas hydathodas in serraturis et alibi ferentia, cystolithis linearibus crebre conspersa, subglabra; petioli 2–5 cm. longi. *Spicae* ♀ 1–2-nae, 6–10 cm. longae; pedunculi aequilongi. *Perianthii* segmenta anguste ovata, 0·7 mm. longa, pilis 1–3 albis conspicuis coronata, ovarium includentia. *Achenium lenticulare*, 1·5 mm. diametro. *Flores steriles* lineares, 1 mm. longi, apice truncati. *Flores* ♂ ignoti.

Smithiella.—Fig. 1, part of plant; 2, stipule; 3, part of leaf; 4, inflorescence; 5, bud; 6, bud in section; 7, fruit; 8, part of fruit open; 9, section of seed.

Eastern Himalaya. Outer Abor Hills: on the sunless side of the Dihong Gorge in dark and very damp places below Rotung at 300 m., in similar situations near Puak at the same elevation and a little higher on the north of the Sidi river. Flowers in December and January. *Burkill* 36076, 37383, 37636.

This remarkable herb can easily be recognised as allied to *Procris*, *Achudemia* and *Elatostema*, even in the absence of male flowers, by its habit and floral characters, but the crowding of minute female flowers on to one side of a slender terminal spike was previously unknown in that group and finds counterparts among the *Urticaceae* only, in such genera as the tropical American Myriocarpas and the Dorstenias of America and Africa. The discoverer noted that the leaves averaged 70 square cm. in area and that they were always covered with drops of water (which had doubtless exuded from the conspicuous water glands).

The genus is respectfully dedicated to Miss Matilda Smith, and the specific name of the first species not inappropriately refers to its innumerable flowers as well as to the very large number of beautiful drawings and paintings of flowers with which Miss Smith has for so many years decorated the *Botanical Magazine*, the *Icones Plantarum* and the *Kew Bulletin*.

XXX.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: XV.

The following additions to the wild fauna and flora have been recorded during recent years. The list of insects belonging to the *Aphididae*, *Psyllidae* and *Aleurodidae* has been drawn up by Mr. F. Laing, of the British Museum (Natural History) from observations made by him in the Gardens in 1914, 1915, and 1919. Mr. Laing remarks that further collecting will, no doubt, reveal many more species, especially amongst the *Aleurodidae* and *Psyllidae*, the present numbers of which are very small when we take into consideration the varied flora of the Gardens. A more up-to-date classification, he adds, might have been adopted in the *Aphididae*, but the classification of this group is in such a chaotic condition that it has been thought better to be conservative rather than use many of the genera which future work may show will not stand.

Fauna.

Coleoptera.

Myrrha octodecimguttata, *L.* On *Urtica dioica*, Queen's Cottage grounds, Sept. 1919, *E. F. Turrill.*

Hemiptera.

Aphididae.

Subfamily Aphidinae.

Macrosiphum, *Pass.*

M. avellanae, *Schr.* On *Corylus avellana.*

M. chelidonii, *Kalt.* On *Rubus idaeus.*

M. (Neomyzus) circumflexum, *Buckt.* On Chrysanthemums and Asters in one of the houses late in the year 1915.

M. convolvuli, *Kalt.* On *Convolvulus* sp.

M. dirhodum, *Walk.* On roses and grasses.

M. granarium, *Kby.* On grasses.
M. millefolii, *Fabr.* On *Achillea millefolium,* common.
M. jaceae, *Linn.* On *Centaurea nigra, Carduus* sp.
M. lactucae, *Schr.* On *Ribes.*
M. pelargonii, *Kalt.* On *Malva* sp. *Geranium robertianum.*
M. pisi, *Kalt.* On *Lathyrus, Lotus.*
M. rosae, *Linn.* On roses, always to be found.
M. rosae, var. **glauca,** *Buckt.* Usually to be found along with the previous species.
M. (Amphorophora) rubi, *Kalt.* On *Rubus spp.* but scarce.
M. rubiellum, *Theo.* This was the common Aphid on *Rubus spp.* in 1915.
M. solanifolii, *Ashm.* This was found in numbers on potatoes being grown in the Gardens in 1919. It has a wide range of host plants and will probably be found on other plants when looked for.
M. sonchi, *Linn.* On *Achillea millefolium, Centaurea, Chrysanthemum.*
M. (Macrosiphoniella) sanborni, *Gill.* Found in one of the houses in 1915. It evidently does not survive out of doors in this country.
M. urticae, *Linn.* On *Urtica dioica.*
Drepanosiphum, *Koch.*
D. platanoides, *Schr.* On *Acer spp.* common throughout the summer.
Rhopalosiphum, *Koch.*
R. berberidis, *Kalt.* On *Berberis spp.* very common in 1915 but not seen at all in 1919.
R. persicae, *Sulz.* Occurs on a very wide range of plants.
R. ligustri, *Kalt.* Apterous females found in 1919 on *Ligustrum sp.,* but evidently very rare.
Melanoxantherium.
M. salicis, *L.* On twig of *Salix Smithiana. H. St. J. Donisthorpe.*
Siphocoryne, *Pass.*
S. (Brevicoryne) brassicae, *Linn.* On *Brassica sp.* growing wild.
S. (Cavariella) capreae, *Fabr.* On willows, *Heracleum, Angelica, Aegopodium.*
Phorodon, *Pass.*
P. humuli, *Schr.* On *Prunus sp.*
Myzus, *Pass.*
M. cerasi, *Fabr.* On *Prunus cerasus,* forming black clusters and a glutinous mass.
M. ribis, *Linn.* On *Ribes* spp.
M. tetrarhodus, *Walk.* On roses, but, as far as our observations go, very rare.
Aphis, *Linn.*
A. (Myzaphis) abietina, *Walk.* On Spruce. *J. W. Munro.*
A. chrysanthemi, *Walk.* On Asters and Chrysanthemums out of doors.
A. edentula, *Buckt.* On *Crataegus monogyna,* rare.
A. epilobii, *Kalt.* On *Epilobium sp.,* rare.
A. hederae, *Kalt.* On Ivy and Holly, occasionally in numbers.

A. lychnidis, *Linn.* On *Lychnis sp.*, rare.

A. pomi, *De Geer.* On *Pyrus spp.*, common throughout the summer.

A. pruni, *Reaum.* On *Prunus sp.*

A. pyri, *Boyer.* On *Pyrus spp.*, rolling the margins of the leaves which turn red.

A. rumicis, *Linn.* On poppies, *Euonymus*, docks.

A. saliceti, *Kalt.* On willows, but scarce.

A. sorbi, *Kalt.* On *Pyrus spp.*

A. viburni, *Fabr.* On *Viburnum Opulus.* Several authors maintain that this species is the same as the one found on *Ribes* (*A. grossulariae*, Kalt.). If such were the case, under the conditions prevailing in the Gardens, one would expect to find *A. grossulariae*, but though careful search has been made repeatedly for it it has not been found.

Subfamily Callipterinae.

Myzocallis alni, *De Geer.* On Alders.

M. castaneae, *Buckt.* (**castanicola,** *Baker*). Swarming on *Quercus* sp. in 1915.

M. coryli, *Goeze.* On *Corylus*, common.

M. (**Tuberculatus**) **quercus,** *Kalt.* This appears to be the species regularly found on Oaks within the Gardens.

Euceraphis betulae, *Linn.* The common species on Birches.

Callipterus betulicola, *Kalt.* On Birch, occasionally.

C. juglandis, *Goeze.* On Walnut trees, very rare.

Eucallipterus tiliae, *Linn.* On Lime trees, rather common.

Phyllaphis fagi, *Linn.* On Beech trees, common throughout the summer, the copper variety appearing to be attacked more heavily than the ordinary one.

Chromaphis juglandicola (*Kalt.*). On Walnut trees, very rare.

Subfamily Chaitophorinae.

Chaitophorus, *Koch.*

C. aceris, *Linn.* Common on all species of *Acer.*

C. populi, *Linn.* Common on Poplars.

C. salicivorus, *Walk.* On *Salix sp.*

C. tremulae, *Koch.* This may be only a variety of *C. populi*, but it seems a well-marked species and is to be found on Aspens but not on Poplars growing in the immediate neighbourhood.

Subfamily Lachninae.

Lachnus, *Burm.*

L. agilis, *Kalt.* On *Pinus sylvestris*, rare.

L. hyalinus, *Koch.* On *Pinus sylvestris*, rare.

L. pini, *Linn.* On *Pinus sylvestris*, frequent.

L. juniperi, *Linn.* On *Juniperus virginiana* (Red Cedar), 8 apterous females, 28. viii. 1919.

Subfamily Schizoneurinae.

Anoecia corni, *Hartig.* Winged females of this species may always be found on *Forsythia*, but the true host-plants are the numerous species of *Cornus* growing within the Gardens.

Eriosoma lanigerum, *Hausm.* On *Pyrus sp.*, but fortunately by no means common.

E. ulmi, *Linn.* On Elm, rolling the leaves, abundant.

Subfamily Pemphiginae.

Pemphigus (Thecabius) affinis, *Kalt.* At the roots of *Ranunculus sp.*, very rare. Trail has recorded this species from Poplar.

P. bursarius, *Linn.* On Poplar, very rare.

P. marsupialis, *Koch.* On Poplar (Trail, Wild Fauna of Kew, 1906.)

Tetraneura ulmi, *Linn.* On Elm, very rare.

Subfamily Vacuninae.

Vacuna dryophila, *Schr.* Not uncommon on Oaks.

Subfamily Hormaphidinae.

Cerataphis lataniae, *Boisd.* On a palm in the Palm House.

Subfamily Phylloxerinae.

Phylloxera quercus, *Boyer.* In 1915 an oak was very severely attacked by this species, the leaves becoming first yellow and then shrivelling.

Subfamily Chermesinae.

Chermes abietis, *Linn.* On Spruce, forming characteristic galls.

C. (Cnaphalodes) strobilobius, *Kalt.* On Larch twigs.

Root-Feeders.

Rhizobius menthae, *Pass.* On roots of *Mentha aquatica*, 1907 (Prof. R. Newstead). I have seen the original specimens but have not found the species again.

Aleurodidae.

Asterochiton phillyreae, *Hal.* On *Phillyrea* and *Crataegus.* This species appears to be quite established within the Gardens.

A. vaporariorum, *Westw.* The adults of this species are usually to be found flying within the houses.

Psyllidae.

Psylla buxi, *Linn.* An exceedingly common species on *Buxus* causing the leaves to form little clusters, inside which live the nymphs.

P. Försteri, *Flor.* On *Alnus.*

P. mali, *Schmid.* On various species of *Pyrus* and *Crataegus*, only too common.

P. pineti, *Flor.* On conifers in the Pinetum.

Psyllopsis fraxini, *Linn.* On Ash, but apparently not common.

P. fraxinicola, *Forst.* On Ash, common.

Coccidae.

Diaspis zamiae, *Morgan*, on Cycads in the Palm House, December, 1919, *E. E. Green.*

Nematoda.

Mermithidae.

Mermis nigrescens, *Dujardin.* This long, thread-like worm has been appearing in many parts of the country during the recent spell of thundery weather, and was found in the gardens on June 16. A parasite of insects, it is frequently found upon the leaves of plants, not, however, necessarily having recently emerged from its host, but from the ground out of which it appears during periods of excessive moisture for the purpose of oviposition. According to Hagmeier,* two years may be passed in the soil by the female before its eggs are ripe for laying. When laid they contain a large, coiled-up embryo. It is not known how this, on becoming a young worm, enters the body of its host. The eggs are probably eaten, in the case of a caterpillar, with its food, hatch in the gut, and then burrow through its wall into the body-cavity.

The egg itself of *M. nigrescens* consists of two shells: an inner one, thick and brown in colour, containing the embryo, and an outer one—thin, colourless, and transparent—bearing at each pole a filamentous process frayed out at the end into a bunch of minute rootlets, by means of which it adheres firmly to the surface of a leaf.

It is the brown colour of the inner shell of the egg which is seen through the body-wall of the female worm, and which in quantity appears as a line down the axis of the animal. After oviposition the worm becomes white. The adult attains a length of 60–150 mm. or more. There is doubtless much confusion between this species and *M. albicans*, von Siebold.

H. A. Baylis.

FLORA.

Phanerogams.

Myrrhis odorata, *Scop.* In quantity and spreading near the Herbarium, May, 1920, *W. B. Turrill.*

Taraxacum obliquum, *Dahlst.* Near the Herbarium, April, 1913. *W. B. Turrill.*

Cynodon Dactylon, *Pers.* Abundant in the turf to the west of the new Range, *Sir W. Thiselton-Dyer.*

Hepaticae.

Riccia fluitans, *L.* In the pond in the Berberis Dell, *F. Escombe,* Oct. 24, 1917.

Fungi.

Lepiota nauseosa, *Wakef.* Nepenthes House, Feb. 1918. (See *Kew Bull.* 1918, p. 230.)

Merulius pinastri, *Burt.* Tropical Pits, September, 1917. (*Ibid.*)

Boydia remuliformis, *A. L. Sm.* Abundant on dead twigs of *Ilex Aquifolium*, Arboretum, Sept. 1919.

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* Zool. Jahrb., Syst., xxxii. (1912) p. 521.

Aleuria tectoria (*Cooke*) *Boud.* On the floor beneath a leaking hot-water pipe, Herbarium, Mar. 1920.

Mastigosporium album, var. **muticum,** *Sacc.* On leaves of *Dactylis glomerata,* L., 1918 (*Kew Bull.* 1918, p. 233).

Mastigosporium album, var. **muticum,** *Sacc.* On leaves of *destina,* Stapf, Tropical Pits, July, 1917. (*Ibid.* p. 233.)

XXXI.—FLOWERING OF PHYLLOSTACHYS AUREA.

J. S. Gamble.

This pretty bamboo *Phyllostachys aurea*, A. & C. Rivière, has recently flowered in this country and good specimens of the flowers have been received from Mr. Charles H. Cave. They came from gardens at Sidbury Manor, Sidmouth, Devonshire, and Rodway Hill House, Mangotsfield, Gloucestershire. It had previously, according to Mr. Bean, in "Trees and Shrubs hardy in the British Isles," vol. 2, p. 150, flowered in the garden of the late Canon Ellacombe at Bitton, and with the late Signor Fenzi at Florence in 1876. It also flowered with Mr. S. T. Heard at Rossdohan, Tahilla, Kerry, Ireland, about 1905. No description of the flowers seems, however, to have ever been published, so that it may be well to put on record the following:—

A caespitose shrub bearing erect stiff closely growing culms which may reach 10 to 15 ft. in height and are at first green, afterwards bright yellow in colour, smooth and shining, from $\frac{1}{2}$–1 in. in diameter at base, where the internodes are short, while further up they reach about 6 in. in length, flattened on one side with sometimes a central ridge. The nodes are conspicuous and have a bluish coloured ring below them when young and when old a raised belt about $\frac{2}{3}$ in. broad. Cataphylls straw-coloured with occasional brown spots, reaching 10 in. in length and glabrous, oblong below, narrowed gradually at the top and produced slightly to meet the ligule about $\frac{1}{10}$ in. long, below which the linear-subulate recurved blade varying from 1 to 4 in. long is inserted. Leaves with glabrous straw-coloured sheaths ending in short auricles with few stiff easily deciduous bristles; blade oblong-lanceolate from a short petiole, the tip long-acuminate and hair-pointed, 3–4 in. long, $\frac{1}{2}$–$\frac{7}{10}$ in. broad, glabrous on both surfaces except for white pubescence along the midrib near the base beneath, the upper edge scabrid, main nerves 5–6 on either side of the midrib, the transverse nervules closely tessellated. Panicle of flowers large, occupying nearly all the joints of the flowering culm and bearing a few leaves only but many deciduous spathaceous straw-coloured sheaths at the bases of the branchlets, the sheaths being about $\frac{3}{4}$ in. long with an ovate acuminate blade about half as long. Spikelets 2-flowered, $\frac{3}{4}$–1 in. long, glume usually one, lanceolate, acuminate, papery, with a short blade, glabrous except the ciliate edges; valve 1, tightly rolled, linear-lanceolate, glabrous, about 7–9-nerved; palea as long as the valve, bidentate, keeled, glabrous except the tips, which are minutely scabrous; stamens with very long exsert filaments: lodicules 1 to 2 when present, which is not always, $\frac{1}{10}$ in. long, oblong.

acute, hyaline, ciliate on the margins, 3–5-nerved; ovary stipitate, depressed, the style very long and slender with three minutely

1, part of stem; 2, sheath; 3, leaves; 4, base of leaf; 5, inflorescence; 6, flowers with anthers; 7, Flowers showing the styles.

feathery stigmas. A. & C. Rivière, "Les Bambous" (1878) 262, figs. 36, 37; Mitf. "Bamboo Garden" (1896) 114; Camus, "Les Bambusées" (1913) 64, pl. 33. 13.

XXXII.—MISCELLANEOUS NOTES.

Mr. W. Nowell, Mycologist on the staff of the Imperial Department of Agriculture in the West Indies (see *K.B.*, 1913, p. 359), has been appointed Assistant Director of Agriculture, Trinidad.

Mr. W. Harris, Superintendent of Public Gardens and Plantations, Jamaica (see *K.B.*, 1896, p. 217), has been appointed Assistant Director of Agriculture and Government Botanist in that Colony.

Mr. T. G. Mason.—The Secretary of State for the Colonies has appointed Mr. T. G. Mason, B.A., Dip. Agric. T.C.D., on the recommendation of Kew, Economic Botanist in the Imperial Department of Agriculture, West Indies.

Mr. F. G. Harcourt, Sub-foreman on the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Superintendent, Antigua, Leeward Islands.

Mr. H. W. Jack, Agricultural Instructor, Agricultural Department, Federated Malay States (*K.B.*, 1914, p. 137), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Economic Botanist in the Department.

Mr. J. N. Milsum, Superintendent of Government Plantations, Agricultural Department, Federated Malay States (*K.B.*, 1913, p. 314), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Agriculturist in the Department.

Capt. J. McDonald.—The Secretary of State for the Colonies, on the recommendation of Kew, has appointed Capt. J. McDonald, B.Sc., of Bristol University, Assistant Mycologist in the Agricultural Department, British East Africa.

Major R. T. Wickham.—The Secretary of State for the Colonies, on the recommendation of Kew, has appointed Major R. T. Wickham, late pilot officer, Royal Air Force, District Agricultural Officer in the Department of Agriculture, Uganda.

Augustin de Candolle.—The premature and unexpected death of Richard Emile Augustin de Candolle, which took place at the family residence at Vallon, Geneva, on 4th May, 1920, removes the representative of the fourth generation of a name which will always remain illustrious in the annals of botanical science, and deprives Kew of a warm and sympathetic friend. The regret which this loss induces is accentuated by the circumstance that it has followed so closely the death of his distinguished father, recorded so recently in these pages (*K.B.* 1919, p. 237).

Born at Walton-on-Thames on 8th December, 1868, Augustin de Candolle was the younger son of the late Anne Casimir de Candolle, of Geneva. His mother was the daughter of the late Dr. William Marcet, F.R.S., of London. After a sound preliminary education in Geneva, young de Candolle was sent to Rugby in 1883. Leaving his public school in 1887 he then proceeded to the University of Heidelberg, afterwards passing to the University of Leipzig as a student in the faculty of law, in which profession he was, after the example of his illustrious grandfather, Alphonse de Candolle, very thoroughly trained. On returning to Geneva he did not take up the formal practice of his profession, but devoted himself, under the direction of his father, to morphological and systematic botanical study, to which he felt impelled alike by natural predilection and a sense of family duty.

Among his more notable contributions to botanical literature

may be mentioned one on the flora of Madagascar based on the collections of Mr. A. Mocquerys, and his descriptions of various previously undifferentiated species, especially from south-eastern Asia. The published results of his biological studies on monospermous capsules are also of much interest and reveal a capacity for sustained research which enables us to realise how much botanical science has lost by his death at the age of 51. But one advantage of his wide and varied education was that his scientific interests were not confined to botany alone. He took a very active part in the business of the Société helvetique des Sciences naturelles, as well as in that of the Société botanique de Genève and the Société botanique suisse. In the case of the Société de physique et d'histoire naturelle, of which he was President in 1914, he served for many years, and greatly to its benefit, as Treasurer of the Association.

After 1911 the scientific pursuits of Augustin de Candolle were greatly impeded by new and important duties of another character. His urbanity of manner and strength of character, his English education and his sound legal training rendered him an ideal incumbent of the post of British Consul for the Canton of Geneva, to which he was appointed on 1st January, 1912. The eight years during which he fulfilled its duties included the whole of the trying period of the great war, and provided him with occupation of a character so absorbing as to leave little opportunity for sustained scientific work. His memory will live in the minds of members of the English community at Geneva and of British travellers whose business necessitated recourse to the advice and assistance of their Consul during the anxious period 1914–18.

The death of his father on 3rd October, 1918, entailing as it did the assumption of his hereditary duties as custodian of the magnificent herbarium and library founded by his greatgrandfather, Auguste Pyrame de Candolle, rendered it incumbent upon Augustin de Candolle to demit his consular duties. The termination of the war enabled him to do this without feeling that he was abandoning his post, and his many friends, conscious of his great natural gifts and aware of the promise afforded by his earlier but all too scanty contributions to science, looked forward with justifiable hope to a long and distinguished custodianship, on his part, of the Candollean treasures. This was not to be, and botany is now the poorer for the loss of one of the most kindly and courteous and most widely informed of her votaries.

Henry Powell.—We record with deep regret the death of Mr. Henry Powell at Mazeras, British East Africa, of heart failure, after a severe attack of malaria, on June 5th.

Mr. Powell had only recently resigned the post of Chief of the Economic Plants Division in the Agricultural Department of the East African Protectorate, and was about to sail for home after his many years of Colonial service. Mr. Powell came to Kew as a young gardener in 1888, and in May, 1890, was appointed Curator of the Botanic Gardens in the Island of St. Vincent. This

post he held until November, 1903, when he was appointed Assistant to the Director of Agriculture, British East Africa (*K.B.*, 1903, p. 31). He was promoted to the post of Chief of the Economic Plants Division in April, 1907. Mr. Powell sent numerous dried plants from St. Vincent to the Herbarium, and during his long service in British East Africa he contributed several collections to the establishment, including a new species of *Boscia* (*B. Powellii*, Sprague & M. L. Green), which was described in the *Kew Bulletin*, 1913, 178. The Library is indebted to him for a set of 4 volumes of *The East Africa Quarterly*, 1904–07.

The Old Linnean Garden at Upsala.—The new Swedish Linnean Society, as a most important aim for its efforts, has decided to restore Linnaeus' botanical garden. This little place, the pride of Linnaeus and famous at his time, was abandoned on the establishment of the new garden more than a hundred years ago, and was allowed to fall into decay. The conservatories were later used as an archæological museum and Linnaeus' house was occupied by the Director of Music at the University.

The garden is now being restored to the original plan, and will be planted only with species grown there by Linnaeus himself. The work has been completed in its general outline, and the garden was opened to the public last May. Linnaeus' house, where he died, will be converted into a museum as a memorial of him which will be supplementary to his country house at Hammarby, familiar to several British botanists. Fortunately his personal belongings have remained in the hands of his few descendants, and it has been possible for the Society to acquire a rich collection, including furniture, porcelain, clothes, etc., so that it is hoped that the old house, which has been left practically untouched, will give a good idea of the surroundings in which he lived and worked. Upsala will no longer be in want of a memorial worthy of its greatest son.

The necessary funds are being collected among members of the Society. Dr. R. Sernander and Dr. O. Juel, Professors of Botany, have taken great pains to find out all the details of the old garden and of its contents. The place is now in charge of Professor N. Svedelius.

The General Secretary of the Linnean Society of London has undertaken to forward to Sweden any contributions towards the restoration of the garden that may be made by British botanists.

C. Skottsberg.

Amphichromy in heather.—An interesting plant of *Calluna vulgaris* showing purple- and white-flowered inflorescences on the same stock was received last year from Mr. Dyson Perrins, Ardross Castle, by Alness, N.B., who found it on a grouse "moor" in the neighbourhood. In the same plant some of the inflorescences have flowers of the normal purple (or more correctly pale magenta)

colour, while the remainder have flowers with white sepals, white or very pale rose petals and red to purple styles and stigmas.

While colour variations in different individuals (purple, magenta, violet, dingy white, pure white) are not uncommon in *Calluna*, the occurrence of two distinct colours in the same stock is rare, and recalls to mind some of the well-known graft-hybrids (e.g., *Cytisus Adami*). A similar case has, however, been described by Lindman (Bot. Not. 1907, p. 201) in a plant collected some miles north of Stockholm, Sweden. The author believed his plant to have arisen by cross-fertilization of a white and a purple heather. If he is correct we have here perhaps a case somewhat similar to that of *Medicago media*, the sand lucerne or variegated alfalfa, a hybrid between the purple- (*M. sativa*) and yellow-flowered (*M. falcata*) lucernes. In this plant many colour variations occur even on one and the same plant, white-yellow, dingy yellow, yellow with violet veins, lilac, and green to green-violet flowers being met with. Experiments with this plant and their results are dealt with by Urban in Brand. Verhandl. xix. pp. 125 seq., 1877. Other interesting examples of the influence of hybridization on colour are to be found in Kerner and Oliver, "The Natural History of Plants," vol. ii. pp. 566 seq., and the more modern work on flower colours with special reference to genetics is dealt with in M. Wheldale, "The Anthocyanin Pigments of Plants," 1916.

Lindman (l.c.) proposes the following terminology for flower coloration:

1. Polychromy, indicating many colours or variegated coloration in the same corolla. Thus *Linaria alpina* has two colours (violet and orange) and *Convolvulus tricolor* three colours (violet-blue, yellow and white) in the same corolla. The two-coloured inflorescences of many Compositae (e.g. *Aster*, *Leucanthemum*) and some Umbelliferae (e.g. *Daucus setulosus* as described in *Kew Bulletin*, 1918, p. 293) would be included here, though Jackson in his "Glossary of Botanical Terms," uses heterochromous in this connection. The polychromy of a hybrid is often due to the mixing of the parental colours (e.g. *Dianthus*, *Iris*).

2. Heterochromy, indicating colour differences between the individuals of one species. This is known, for example, in *Hepatica triloba*, *Melampyrum cristatum*, *Anthyllis vulneraria*, *Calluna vulgaris* (see above) and many other species. Sexual heterochromy between male and female plants of a dioecious species is not infrequent. Jackson (l.c.) defines "heterochromatism" as "a change in the colouring or marking of petals."

3. Amphichromy, indicating difference in the colouring of the flower on the same stock, this is most often due to crossing or some other accidental influence. It is habitual in *Cytisus Adami* and *Medicago media*, but individual and local in *Polygala amarella*, *Viola canina*, *Azalea indica*, and *Calluna vulgaris*. Miss Gibbs (Journ. Linn. Soc. Bot. xxxix. p. 146) describes red and yellow flowers of *Metrosideros villosa* as sometimes occurring on the same tree in Fiji. Monoecious plants are often sexually amphichromatic, with more conspicuous colours in the male.

4. Metachromy, indicating the changing or losing of colour in one and the same flower, generally with age. Examples are several *Borraginaceae*, *Ribes aurem* and certain forms of *Viola tricolor*.

Two or more of the above categories may be represented in one and the same plant. Thus *Medicago media* shows amphichromy, heterochromy, and metachromy; *Viola tricolor* f. *versicolor* is polychromatic, metachromatic, heterochromatic, and perhaps even sometimes amphichromatic. Certain plants are known to vary in regard to floral coloration with the season, producing flowers of one colour in one season, of another colour in another season. This change of floral colour in one and the same or in separated stocks can be termed seasonal amphichromy or seasonal heterochromy. W. B. T.

Cardamine pratensis β uniflora in Britain.—An interesting and at first sight striking form or variety of the common lady's smock was received in April this year at Kew. It was found by Miss M. E. Francis "in damp ground in a copse, where quantities of lady's smock grows," near Rudgewick, Sussex. The plant has well-developed radical leaves and shows no sign of starvation, but all the peduncles are about 9 cm. high, one-flowered and quite destitute of cauline leaves or bracts. In the specimen received 5 of them arise from the rosette of basal leaves.

This plant is evidently similar to that described as *Cardamine pratensis β uniflora* by Sternberg and Hoppe in Denkschr. Bot. Gesell. Regensburg, 1815, p. 157, where the following description is given: "acaulis, aphylla, uniflora, foliis radicalibus petiolatis, pinnatis impari majore transverse ovato, dentato." The authors state that they found it in abundance in a damp meadow near a colliery in Bohemia. Some plants transplanted into pots and wintered in a glasshouse spread during the winter and, according to these authors, in the following spring changed back to ordinary *C. pratensis*!

In the Watson Herbarium at Kew there is a specimen of *C. pratensis β uniflora* from the Braemar mountains, Aberdeenshire, collected by H. C. Watson in 1844. No reference has, however, been found in recent floristic literature to this plant, which may be looked upon as an unstable mutation or sport. W. B. T.

Botanical Exploration in Chile and Argentina.—The following travellers and publications should have been referred to in the paper on this subject published in the *Kew Bull.* No. 2, 1920, pp. 57–66: **John Ball,** in Journ. Linn. Soc. Bot. xxi. p. 203, 1884, published "Contributions to the Flora of North Patagonia and the adjoining Territory," which consists of an account of plants collected by **G. Claraz,** a Swiss gentleman, in Argentine territory. In the same author's paper in the Journ. Linn. Soc. Bot. xxii. 1886, p. 137, entitled "Notes on the Botany of Western South America," pp. 158–168 he deals with plants from localities in Chile. Again in the Journ. Linn. Soc. Bot. xxvii. 1891, p. 471, Ball, under

the title "Further Contributions to the Flora of Patagonia," dealt with a collection made by **W. Andrews** in Patagonia and presented by him to Kew. The writer is indebted to Prof. Hans Schinz of Zurich for calling his attention to these papers by Ball.

F. Meigen, in Engler's Bot. Jahrb. xvii. 1893, p. 199, has a paper, "Skizze der Vegetationsverhältnisse von Santiago in Chile," which contains a general account of the flora between Aconcagua and Maipu and a list of all the plants known from this area.

Frömbling, in Bot. Centrl. xvi. Jah. Bd. 62, 1895, pp. 4, 40, published a general account of botanical excursions conducted during three years' stay in Chile.

F. W. Neger, in Engler's Bot. Jahrb. xxiii. 1896, p. 382, has an account of the vegetation in S. Chile under the title "Die Vegetationsverhältnisse im nordlichen Araucanien (Flusegebiet des Rio Biobio)." The same botanist, in Engler's Bot. Jahrb. xxviii. 1899 1901, p. 231, has a paper "Pflanzengeographisches aus den südlichen Anden und Patagonien," which records the observations made and the plants collected in the summer of 1896–1897 in the Cordillera de Villarica.

Expedition Antarctique Belge.—Resultats du Voyage du S.Y. *Belgica* en 1897–1899. Botanique (Les Phanerogames des Terres Magellaniques) par **E. de Wildeman,** 1905. This work consists of (1) a systematic enumeration of the Phanerogams collected by **M. E. Racovitza** during the voyage of the S.Y. *Belgica* towards the S. Pole, (2) a systematic enumeration of the Austro-Antarctic American Phanerogames, and (3) statistical tables of the same. The reports of the **Princeton University Expeditions to Patagonia, 1896–1899,** vol. viii. Botany, is at present composed of three bulky volumes, most of which are occupied by G. Macloskie's "Flora Patagonica." A useful bibliography is given in the second volume. W. B. T.

The Flora of Jamaica.—The 4th volume, the 3rd to be published, of the "Flora of Jamaica," by W. Fawcett and A. B. Rendle, has now appeared, and consists of 369 pages of printed text and incorporated figures. The arrangement followed is that of Engler's Pflanzenfamilien, and the orders dealt with in the present part are the following: *Leguminosae, Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae, Zygophyllaceae, Rutaceae, Simarubaceae, Burseraceae, Meliaceae, Malpighiaceae, Polygalaceae, Euphorbiaceae* and *Callitrichaceae*. Of these, the *Leguminosae* occupy 153 pages and the *Euphorbiaceae* 100 pages. Each genus is illustrated by a text figure and dissections. The keys and descriptions are in English and full references to bibliography and synonyms are provided. An index to the single volume is provided at the end. W. B. T.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7] [1920

XXXIII.—A TRIP TO THE KNYSNA.

S. Schonland.

Superintendent, Albany Museum, Grahamstown, South Africa.

In connection with the work for the Botanical Survey of the Union of South Africa (started in 1918), I have used part of my holiday time in making several extensive trips with a view to planning out more detailed work and to getting some more definite information on the limits in my area of the various phytogeographical regions. Incidentally a fair number of plants were collected and observations on them noted. The last trip, which covered over 900 miles, took me from Grahamstown through the southern edge of the Great Karroo, then to the Knysna, the T'Zitzikamma, Uitenhage and back to Grahamstown. It lasted a month from the 19th of December, 1919, of which 16 days were spent at the Knysna. In making such a trip even an old resident of South Africa like myself comes across a hundred and one things of interest apart from botanical matters. The botanical results unfortunately, owing to a terrible drought, were not commensurate with the time spent in travelling. Moreover, the collections made have not been worked up yet, and when this is done they will have to be co-ordinated with the work of other botanical travellers, such as Burchell, Drège, Ecklon, Zeyher, Krauss, Schlechter, Galpin. etc., who have visited the Knysna district. I felt, therefore, some hesitation in accepting at this stage the invitation of the Director of Kew to give an account of my trip. I have, however, picked out of my diary a few items which may be of interest to readers in Europe.

Leaving Grahamstown for Somerset East grassveld is left behind within a few miles even before the descent into the Fish River valley is reached. This broad valley has quite a different climate from that of Grahamstown, and its vegetation is quite karroid. The moment we left the grassveld the effects of extreme drought became apparent. We travelled for about 300 miles up to the neighbourhood of Uniondale without seeing in the veld a single plant in flower except *Acacia Karroo*, and this in a region of summer rains! It is true, even at the best of times, not much rain is expected, but, for

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instance, while the rainfall at Willowmore is normally about 10 in., in 1919 only 5 in. had fallen. Not a green blade of grass could be seen, although near Bedford (after emerging from the Fish River valley) there is a good deal of grassveld. Even the small Karroo bushes which are adapted to extreme conditions of drought were withered everywhere, and no doubt a large number of them had died, although it is marvellous to see after a rain how so many of them, which to a casual observer look dead, sprout out again. A good deal of stock had died, yet we saw a fair amount of game, numerous herds of goats, many cattle, etc. Some progressive farmers whom we met had reserves of lucerne and had provided drinking water for their herds by means of boreholes and dams, but it seems a puzzle how the non-progressive farmers (and they are unfortunately in the majority) kept their stock alive, and how the wild bucks managed to subsist. As an example, we will take the south-west corner of the Somerset East district draining towards the Sundays River and the greater part of the Jansenville district. Here we were in what was nothing but a stony desert sprinkled over at intervals with plants, amongst which a cactaceous Euphorbia (*E. coerulescens*, Haw.), is the most conspicuous. It occurs in clumps about 3 ft. high. It is locally known as *Noors*. Now this plant, which is spiny, is liked by all kinds of stock. It is slashed by the farmers, and, when half withered, is greedily eaten by the animals, or the dry herbage inside the clumps is fired and the spines are thus partly burned off. Goats and cattle will even tackle the plant as it stands, in spite of the spines. Another succulent Euphorbia (*E. esculenta*), which occurs in the same neighbourhood and which is even a better food for stock, is threatened with extermination. Our kind host on one occasion, Mr. P. Weyer, of Toekomst, pointed out to us some other valuable stock-food plants which unfortunately are getting scarce in the Karroo. Amongst them were (apart from others which are well known to S. African botanists): species of *Aizoon*, *Aster* (*Diplopappus*) *Hermannia* and *Cadaba juncea*. In fact, as the late Dr. MacOwan and Dr. Marloth have repeatedly pointed out, when one wants to approach the question of South African pasture plants one must get quite away from the ideas gathered from European text-books.

After my visit beautiful rains fell in the Karroo (as much as 14 in. at Graaff Reinet in two months), and the country looks in many places like a flower garden now (end of March). Especially between the fences bordering the railway line, there is in numerous places thick grass 2–3 ft. high. I had an opportunity to see this between Cradock and Naauwpoort. Owing to overstocking comparatively little grass was seen outside these fences. The dwarf Karroo bushes were supreme.

Visitors fresh from Europe may well wonder how it is that a large part of the Karroo is amongst the finest stock-countries in the world, but one of the most widely spread of the pasture plants, *Pentzia virgata*, has nearly the same feeding value as lucerne. Unfortunately owing to overstocking and kraaling the vegetation is rapidly deteriorating. Owing to kraaling well-defined paths are made by stock which in rain become water-courses. These

become deeper and deeper, they widen out, and dongas are formed which carry off the rainwater rapidly, lower the water-level, etc. Attention has been frequently called to this evil, and it is hoped that before long active steps will be taken to prevent the Karroo from becoming a real desert. Some farmers have at all events tried to preserve the more or less extensive alluvial soils (which are probably the most productive in the world) from being washed away. They have built walls and formed terraces to break the force of the water-currents, and have blocked up dongas which soon get filled with silt that in many cases is excellent for crops. The terraces act at the same time as reservoirs, and on various farms we saw most marvellous results achieved by this method. For instance, on Mr. Codner's farm near Willowmore, we saw a large stack of wheat grown without irrigation in a year with a total of 5 in. of rain, on another field a good yield of green barley had been obtained; higher up there was an orchard with healthy trees of apples, pears, plums, apricots, peaches, etc., all in full bearing and quite healthy.

Five miles from Willowmore Rhenoster bosch (*Elytropappus rhinocerotis*) begins. This covers huge areas, especially on the northern slopes of the mountains as far as Grahamstown in the east, and is also widely spread towards the west. It is not touched by any kind of stock. Here and there progressive farmers have eradicated it at great cost. However, until we reach practically the crest of the Langeloof mountains beyond Uniondale the vegetation is to a large extent karroid. Then comes a transformation. Suddenly a few *Proteaceae* make their appearance, and when the crest itself is reached the Rhenoster and Karroo veld is left behind and pure south-western associations, constituting the true Cape Flora, are seen as far as the eye can reach: *Proteaceae*, *Restiaceae*, *Bruniaceae*, species of *Cliffortia*, *Watsonia*, *Ericaceae*, *Orchidaceae* and hosts of other plants characteristic of the south-western Cape Flora are here met with in abundance on the southern face of the mountains, and not one (except very close to the top) can be found on the northern slopes. I have on several previous occasions passed these sharp boundaries between the karroid and south-western types, but every time I see one of them it sends a thrill through me. It is just as if we had here a large botanic garden in which the various types of plants were kept separate by artificial means, but as Marloth first pointed out, mists which do not go north of these mountain ranges and increased rainfall account for the whole difference. In fact, if we could get accurate data of the amount of "beneficial" moisture available at different seasons for plants in a particular spot (not mere rainfall statistics), we could, in Cape Colony at all events, fairly accurately predict its type of vegetation. Altitude, as Bolus first pointed out, has very little influence on the distribution of our vegetation. In fact, on the Knysna trip, we found a number of species from an altitude of over 3000 ft. to near to sea-level. Soil also plays a very secondary rôle, for instance, the Knysna forest is partly on Table Mountain sandstone, partly on Bokkeveld beds, which, having been eroded into steep slopes, retain less moisture, and consequently the forest on them is not so tall as that on the Table Mountain sandstone.

After crossing the Langekloof (which on a previous occasion I ascertained to belong throughout its whole length to the South-Western Region), the real descent towards the sea is begun on the Prince Alfred Pass, and the trip from there to the Knysna is certainly the finest in South Africa as far as my experience goes. I will not attempt to describe its beauties which culminated in reaching the Knysna forest.

There are three main groups of forest areas in the region to which the Knysna forest belongs. Henkel* calls them respectively the George, Knysna and T'Zitzikamma groups. They occur in a tract of country lying between the Great Brak River beyond George and Clarkson, near Humansdorp. They are all south of the Outeniqua —T'Zitzikamma—Kareedouw Range of mountains, the average height of which is 4000 ft., some of its peaks rising over 5000 ft. But high forest is seldom found over 2000 ft., and is consequently almost entirely restricted to the foothills of these mountains, hiding itself to a certain extent in deep ravines. The total area of high forest is approximately 112,000 acres, and Mr. Henkel estimates that possibly 10,000 acres have been destroyed by recurring fires. Of the total amount 70,000 acres belong to the Knysna group which contains the largest patch of forest in South Africa—the Knysna forest. From what has been said it follows that if we take a bird's-eye view of the zone in which these forests are located their total extent, even allowing for former extension, is hardly sufficient for one to denote this area as "the" Forest Region of South Africa and to contrast it with the South-Western Coast Region and other primary divisions. Leaving out of account the areas of the mountain ranges themselves and the Langekloof which all have typical south-western vegetation (apart from enclosures of karroid succulent vegetation on suitable rocky exposures), and which cannot be separated from the area under discussion, a rough calculation shows that the George forest patches occupy about 1/25 of the area in which they occur, the Knysna group occupies 1/5, and the T'Zitzikamma group about 1/8 of its area. To put it in a different way: on the narrow coast plateau on which these groups are mostly found with an area of over 15,000 square miles, there used to be about 190 square miles of forest of which about 175 square miles remain, the remainder (apart from coast vegetation and patches of karroid vegetation) is typically south-western. On other grounds to which reference will be made, the separation of this part of South Africa as a Forest Region, as first introduced by Rehmann, is not advisable.

The more important trees in the high forest† are *Ocotea bullata* (4 per cent.), *Podocarpus elongata*, *P. Thunbergii* (11 per cent.), *Cunonia capensis*, *Olea laurifolea* (18 per cent.), *Nuria floribunda*, *Curtisia faginea*, *Platylophus trifoliatus*, *Apodytes dimidiata*.

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* Henkel, the indigenous high forest situated in the divisions of George, Knysna and Humansdorp. "S. A. Journ. of Science." Nov., 1912.

† See Henkel, l.c. p. 70, and Marloth, Das Kapland. The figures in brackets denote the percentage the trees represent in the Knysna forest. There are nearly 50 different kinds altogether, many of which constitute only a small fraction of the total.

Pterocelastrus variabilis (7½ per cent.), *Gonioma Kamassi* (15½ per cent.), *Virgilia capensis*. Others do not occur so frequently. In one patch at the Knysna *Faurea saligna* is found. The understorey of shrub growth consists principally of *Trichocladus crinitus* and numerous ferns, especially the beautiful tree-fern, *Hemitelia capensis*. Of the trees mentioned, *Ocotea bullata* has somewhat discontinuous distribution in the coast districts of South Africa, the genus *Faurea* does not occur again in an easterly direction until the Bashee River in the Transkei has been crossed. *Virgilia capensis* is south-western and stops at Van Stadens, near Port Elizabeth. *Platylophus trifoliatus* does not reach the Cape Peninsula in the west and also does not extend beyond Van Stadens. Thus there is a certain amount of endemism: but on the whole we recognise that these forest patches—like the forest patches further east—are distinctly outliers of the Tropical African forest flora. In a sense they are intruders which cannot be utilised to form primary phytogeographical divisions. They are found only where the configuration of the country and other circumstances favour a greater rainfall than is found in neighbouring parts and where the plants are protected from drying winds, although all these forest trees are slightly xerophytic. It is, therefore, not likely that the South African forests, even in our narrow coast districts, had ever a wider distribution as long as climatic conditions were approximately what they are now, although the discontinuous distribution of some trees, shrubs and other forest plants seems to point in the opposite direction, and although we know that since the advent of man much forest growth has been destroyed. I have already referred to the discontinuous distribution of *Ocotea bullata* and *Faurea*. A few more examples may be quoted. *Pygeum africanum* occurs at Bluekrantz, near the Knysna, and is not found again in an easterly direction until we come to the neighbourhood of King Williamstown, a distance of about 250 miles. *Strelitzia augusta* is also found at Bluekrantz, and is not met with again when travelling eastwards until Natal is reached. Mr. J. D. Keet, district forest officer, Knysna, drew my attention in the forest to a tree-orchid which in its vegetative organs is exactly like *Calanthe natalensis*, not previously found west of the Pirie bush near King Williamstown. However, until this orchid has been examined when in flower, we cannot be quite sure that it is this species. Amongst animals inhabiting South African forests there are also very striking instances of discontinuous distribution known.

South Africa uses up an enormous amount of timber every year, chiefly for railway-sleepers, house-building, mine-props, wagon-building, furniture, etc., but it is very far from self-supporting in this respect. In former years the system of working, even of the Government forests, has been lamentable, and many parts of them have been ruined for an indefinite period. During the last 25 years or so, however, a rotation system has been introduced which allows a definite supply to be drawn from certain sections, while others have a chance to recuperate. Fortunately such a valuable tree as *Ocotea bullata* (Stinkwood) coppices freely, yellowwoods sow themselves freely, but all our South African valuable timber trees grow very slowly, and even do not flourish as well

in plantations as in their natural conditions. Much experimental work on this and other points remains, however, to be done yet, and some experiments are actually in progress at Concordia, close to the town of Knysna. In the meantime large plantations of exotic trees have been made in many places between George and Storms River (as also in other places in South Africa), and others are being formed. Before many years are past the timber from the Government plantations will exceed in value that from the natural forests, though the latter will continue to furnish valuable timber, especially for furniture, wagon-making, etc. At Concordia *Pinus insignis*, *Pinus Pinaster*, and *Eucalyptus rostrata* are chiefly grown. In another plantation we saw *Pinus canariensis*, which looked healthy and had made a good start; *Cryptomeria japonica*, Cork oak, Cedar, and the Camphor tree were not doing particularly well. Many others are being tried, but it is too early yet to pronounce judgment on them. *Ocotea bullata*, *Xanthoxylon capense*, *Curtisia faginea*, *Nuxia floribunda*, *Toddalia lanceolata* come up self-sown between pines, and it remains to be seen whether it will be worth while to retain them under these conditions. I should like to have enlarged more on the Knysna forest, on its wealth of Fungi, Bryophytes, Ferns, etc., on its climbing plants and epiphytes, but space forbids, nor can I touch on the very interesting plant formations and associations found outside the forest. The whole stretch of country from George to near Humansdorp is a botanical paradise which botanists so far have only glanced at, as the difficulties of travelling in it, even to this day, are very considerable, and large parts of even the main roads have to be negotiated very cautiously, especially in wet weather. To anybody not used to South African motor travelling it will be a novel experience to dip down into such a spot as the Bluekrantz gorge and crawl out again, or to slither into the Elands River drift. The denseness and wildness of the Knysna forest may be gauged by the fact that there is still a small herd of elephants in it; in fact, we saw their spoor near Deepwalls, close to the main road.

On our return journey we passed along the T'Zitzikamma road. As we ascended the Pass over the Kareedouw mountains, near Assegai Bush, the effects of severe drought became again apparent, and were simply appalling further on in the Uitenhage and Alexandria divisions. To give only one instance: I stopped at the corner of the Witteklip, near Van Stadens, where normally there is an abundance of flowers of plants of the South-Western types, yet I could get absolutely nothing, nor did I see anything in flower in the karroid scrub, which one reaches a few miles further on, when one has crossed the crest of the plateau, except the weird inflorescences of the plant which Baker calls *Urginea altissima*. In concluding this very brief sketch a few points of phytogeographical interest met with on the return journey may be mentioned. At Kabeljauws river, a few miles east of Humansdorp, *Acacia karroo*, which we had not seen since leaving the Karroo, was again met with. Here also is the western limit of Tree-Euphorbias (*E. tetragona*). I have on another occasion pointed out that the South-Western Region goes as far

as Port Elizabeth. This, of course, does not mean that elements characteristic of other regions are absent from it; in fact, here and there, more or less large associations which seem to be foreign to the region occur, for instance, associations of forest plants and Karroo plants, as pointed out already. From the heights east of the Gamtoos River to the beginning of the Van Stadens Gorge we travelled through typical South-Eastern grass country with scattered bush such as we find near Bathurst, south of Grahamstown. The last point I would like to refer to is this. On a previous trip I had confirmed one of Ecklon's observations—unfortunately overlooked by Bolus and others—that karroid vegetation stretches from Port Elizabeth to the mouth of the Sundays River, thus forming a broad wedge between the South-Eastern and South-Western Regions. I noticed that this wedge consists, near Coega, partly of low karroid shrublets (including *Pentzia virgata*). On the trip here dealt with I travelled from Uitenhage to Coega, and I ascertained that there are extensive flats on this road covered with these karroid shrublets. Karroid vegetation is also found all over the hill called the "Coega Kop," which is composed of Table Mountain sandstone, another of the numerous instances which we have of the secondary influence of geological formation on the distribution of plants in South Africa.

XXXIV.—PHELLODENDRON.

T. A. Sprague.

The genus *Phellodendron* (*Rutaceae–Toddalieae*) was described by Ruprecht in 1857 from specimens collected by Richard Maack in Amurland.* An excellent detailed generic description is given in Sargent's Trees and Shrubs, i. p. 195 (1905); the following diagnosis may, however, be useful to those who are unable to consult that work.

Trees with opposite, imparipinnate leaves. *Axillary bud* concealed in a little pocket between the base of the petiole and the stem. *Leaflets* very finely crenulate-serrulate or subentire, dotted with pellucid glands along the margins. *Flowers* paniculate, dioecious, pentamerous. *Calyx* small, 5-lobed. *Petals* much larger, boat-shaped, greenish-yellow, slightly imbricate. *Disc* none. *Male flower*:—*Stamens* 5, hypogynous, alternating with, and about twice as long as the petals; anthers sagittate, introrse. *Gynophore* oblong, bearing 5 rudimentary villous pistils. *Female flower*:—*Staminodes* 5, very small. *Ovary* subglobose, glandular-punctate, 5-locular, with a very short thick style and depressed-capitate, 5-lobed stigma. *Ovules* solitary, pendulous. *Fruit* a drupe with aromatic flesh enclosing 5 pyrenes. *Endocarp* cartilaginous, translucent. *Seeds* with a thin layer of endosperm. *Embryo* large; cotyledons flat.

The type-species, *Phellodendron amurense*, Rupr., is a tree with extremely corky bark (whence the generic name, meaning "Cork

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* Bull. Acad. Pétersb. xv. p. 353 (1857).

Tree"), which is used by the native fishermen of the middle Amur for making floats for their nets. It has a wide distribution in Russian and Chinese Manchuria, and has also been recorded from Corea and Japan.

The form which occurs in the island of Sachalin has a smooth, not corky bark, and was described as var. *sachalinense* by Friedrich Schmidt, with the following diagnosis: "ramis junioribus omnino esuberosis, foli[ol]is latioribus brevioribus, seminibus quam in planta amurensi magis convexis minoribus."* Schmidt cited a specimen collected by Albrecht, near Hakodate, in Japan, as apparently belonging to the same variety. In spite of careful investigation, he was unable to find sufficient differential characters to justify the separation of var. *sachalinense* as an independent species. Sargent, however, raised the variety to specific rank as *Phellodendron sachalinense*.† His description was drawn up, mainly, if not entirely, from trees which had been raised in the Arnold Arboretum in 1887 from seeds sent from Japan. According to him, *P. sachalinense* differs from *P. amurense* in the darker colour of the branchlets, the thinner, not corky bark, rufous-pubescent, instead of silvery-pubescent, winter buds, leaflets not lustrous on the upper surface, glabrous on the margins, and the glabrous inflorescence. The type specimen of var. *sachalinense* in the Kew Herbarium (Tunai, September, 1860, *Schmidt*) has, however, a distinctly pubescent inflorescence and infructescence, so that the last character does not hold good. The axillary buds are rufous-pubescent, and the leaflets have glabrous margins, but the remaining characters cannot be verified from the herbarium specimen.

According to Sargent, the Japanese tree which has hitherto passed under the name *Phellodendron amurense*, should be called *P. sachalinense*. He cited Japanese specimens of the latter species, but none of the former, and suggested that *P. amurense*, Franch. et Sav. Enum. i. p. 73, was a synonym of *P. sachalinense*.

Sargent's views may be summarised in the following propositions: 1, that the Arnold Arboretum *sachalinense* is specifically distinct from *P. amurense*; 2, that it is identical with *P. amurense*, var. *sachalinense*, Fr. Schmidt; 3, that it occurs in a wild state in Japan, near Hakodate and Sapporo.

(1) The evidence for the specific status of *sachalinense* seems insufficient: trees raised at Kew from seeds received as *P. sachalinense* in 1904 from the Arnold Arboretum, agree with Sargent's description in having a non-corky bark, but the leaflets are ciliate and lustrous on the upper surface, and the inflorescence is not glabrous. *Phellodendron* is dioecious, however, and the seeds may possibly have been the result of a cross with some other species or variety cultivated in the Arnold Arboretum. On the other hand, a tree received in 1910 from the Japanese Exhibition, and grown at Kew under the name *P. sachalinense*, also has a non-corky bark and ciliate lustrous leaflets, so that unless this also was a hybrid, the leaflets of *P. sachalinense* evidently do not

* Reisen in Amur-lande, p. 120 (1868).
† Trees and Shrubs, i. p. 199 (1905).

differ from those of *P. amurense* in being dull on the upper surface and having glabrous margins. Nor does there appear to be any marked difference between *sachalinense* and *amurense* in the colour of the branchlets. It seems desirable, therefore, to treat the cultivated *sachalinense* as a variety of *amurense*.

(2) Sargent's identification of the cultivated *sachalinense* with *P. amurense* var. *sachalinense*, Fr. Schmidt, may, on the other hand, be accepted. Both trees differ from typical *amurense* in having a non-corky bark, and relatively broader leaflets.

(3) The identification with var. *sachalinense* of the Japanese tree, hitherto known as *P. amurense*, is open to question. The leaflets of wild specimens from Japan certainly resemble those of var. *sachalinense* in shape, but the labels afford no information as to the nature of the bark, which furnishes the most important character of the variety. Furthermore, the figures of the bark of Japanese *amurense* given by Shirasawa, Ic. Ess. For. Jap. ii. t. 33, ff. 27, 28 agree, in the writer's opinion, with typical *amurense* rather than with var. *sachalinense*. The question is recommended to the attention of Japanese botanists, as it can be elucidated most satisfactorily by a study of the living trees.

It is, moreover, complicated by the existence in Japan of another variety or form of *P. amurense*, which Dode has described as an independent species, *P. Lavallei*, from a tree of Japanese origin cultivated in the Arboretum at Segrez.* This differs from *P. amurense*, according to Dode, in the leaflets, which are lanceolate-ovate instead of lanceolate, and have the nerves of the lower surface clothed with stiff white hairs. It has been in cultivation in England for about 40 years, and has hitherto passed under the names *P. japonicum* and *P. sachalinense*. Apart from the indumentum, it seems to differ in no respect from the usual Japanese form of *P. amurense*, and it may therefore be named *P. amurense* var. *Lavallei*.

A specimen in the Kew Herbarium, gathered by Tschonoski in 1865 in subalpine woods in the province of Nambu, Nippon, agrees with var. *Lavallei*. Sargent referred the corresponding specimen in the Gray Herbarium to *P. japonicum*, from which the Kew specimen differs in the cuneate base of the leaflets, and the nature of the indumentum.

Phellodendron japonicum, Maxim., appears to be confined to Fujiyama, and is well characterised by the thin bark which peels off in small scales, the shorter and broader leaflets, rounded at the base and softly pubescent on the lower surface with rather curly hairs, and the larger fruits.

A third species which is in cultivation at Kew is *P. chinense*, Schneider, of which *P. sinense*, Dode, is a synonym. This is a native of Hupeh, and may easily be recognised by its very compact inflorescence.

Phellodendron macrophyllum, Dode, and *P. Fargesii*, Dode, are known to the writer from description only, and do not appear to be in cultivation. The former has very large leaflets, up to 20 cm.

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* Bull. Soc. Bot. France, lv. p. 648 (1909).

long and 9 cm. broad; and the latter has a small compact inflorescence, resembling that of *P. chinense*, from which it differs in the narrower leaflets. Both are natives of Szechuan.*

The cultivated species and varieties of *Phellodendron* may be distinguished as follows:—

Inflorescence compact; leaflets oblong-lanceolate with nearly parallel margins 3. *chinense*.

Inflorescence lax:

Leaflets broadly ovate, rounded at the base, shortly acuminate, softly and rather densely pubescent on the lower surface; bark thin, peeling off in small scales ... ... 2. *japonicum*.

Leaflets ovate, ovate-lanceolate or lanceolate, not softly pubescent on the lower surface:

Nerves more or less pilose on the lower surface; bark of trunk and old branches corky ... ... 1. *amurense, var. Lavallei*.

Only the base of the midrib pilose on the lower surface:

Bark not at all corky ... ... 1. *amurense, var. sachalinense*.

Bark of trunk and old branches corky ... ... 1. *amurense*.

1. **P. amurense,** *Rupr.* in Bull. Acad. Pétersb. xv. p. 353 (1857); Maxim. Prim. Fl. Amur. p. 72, t. 4; Regel, Fl. Ussur. p. 42; Fr. Schmidt, Reisen in Amur-Lande, p. 37; Franch. Pl. David. p. 67, Komarov, Fl. Manshur. ii. p. 668; Franch. et Sav. Enum. Pl. Jap. i. p. 73; Shirasawa, Ic. Ess. For. Jap. ii. t. 33, ff. 16–30; Matsum. Ind. Pl. Jap. ii. pars. 2, p. 293; Nakai in Journ. Coll. Sc. Tokyo, xxvi. Art. 1, p. 117; Sarg. Trees and Shrubs, i. p. 197, t. 93; Schneider, Ill. Handb. Laubholzk. ii. p. 125; Bean, Trees and Shrubs, ii. p. 131.

Distrib. Russian and Chinese Manchuria, Northern China, Corea, Japan.

The writer, for reasons already given, follows Franchet and Savatier, Shirasawa and Matsumura in recording *P. amurense* from Japan. Pritzel (in Engl. Jahrb. xxix. p. 424) cites several specimens of *P. amurense* from Central China. The one collected by Henry is evidently *P. chinense*, Schneider. The other specimens should be re-examined.

var. **sachalinense,** *Fr. Schmidt*, Reisen in Amur-Lande, p. 120 (1868); Palibin, Consp. Fl. Kor. i. p. 51; Nakai in Journ. Coll. Sc. Tokyo, xxvi. Art. I, p. 117; Miyake et Miyabe, Fl. Saghalin, n. 124.—*P. sachalinense*, Sarg. Trees and Shrubs, i. p. 199 (1905); Bean, Trees and Shrubs, ii. p. 132.

Distrib. Sachalin, Corea (fide *Palibin*).

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* Bull. Soc. Bot. France, lv. pp. 648, 649 (1909).

This variety is cultivated in Japan, and may possibly be indigenous there. It differs from typical *amurense* mainly in the nature of the bark, so that it is hardly possible to recognise it from herbarium specimens unaccompanied by notes or samples of bark. Sargent records *P. sachalinense* from Szechuan (Pl. Wilson. ii. p. 136). The writer has not seen the specimens cited.

var. **Lavallei,** *Sprague.*—*P. Lavallei,* Dode in Bull. Soc. Bot. France, lv. p. 648 (1909).

Distrib. Japan: Province of Nambu, in subalpine woods, 1865, *Tschonoski.*

2. **P. japonicum,** *Maxim.* in Bull. Acad. Pétersb. xvi. p. 212 (1871); Mél. Biol. viii. p. 1; Franch. et Sav. Enum. Pl. Jap. i. p. 73; Matsum. Ind. Pl. Jap. ii. pars 2, p. 293; Hayata, Veg. Mt. Fuji, p. 75; Schneider, Ill. Handb. Laubholzk. ii. p. 125; Bean, Trees and Shrubs, ii. p. 131.

Distrib. Japan: Fujiyama, in the deciduous broad-leaved tree-region.

According to Matsumura, *P. japonicum* is confined to Fujiyama. Sargent, Trees and Shrubs, i. p. 201, cited under *P. japonicum,* Tschonoski's specimen from Nambu, which the writer refers to *P. amurense,* var. *Lavallei*; and Henry's no. 4003, from Hupeh, which is *P. chinense,* Schneider, as he himself subsequently recognised (Pl. Wilson ii. p. 137).

Pritzel recorded the occurrence of *P. japonicum* in Central China, which is highly improbable (Engl. Jahrb. xxix. p. 424).

3. **P. chinense,** *Schneider,* Ill. *Handb.* Laubholzk. ii. p. 126 (1907); Sarg. Pl. Wilson. ii. p. 136; Bean, Trees and Shrubs, ii. p. 131. *P. sinense,* Dode in Bull. Soc. Bot. France, lv. p. 649 (1909). *P. amurense,* E. Pritzel in Engl. Jahrb. xxix. p. 424, non Rupr.

Distrib. China: Hupeh, *Wilson* 1972, 2739; Patung District, *Henry* 4003, 5202.

XXXV.—ON TWO SPECIES OF OVULARIOPSIS FROM THE WEST INDIES.

E. M. Wakefield.

Since 1906 lists of fungus diseases of plants in the West Indies have contained references to a mildew on cotton, which has been called, for the sake of distinction, the "West Indian Leaf Mildew' of cotton, as it was apparently unknown from any other part of the world.* In the West Indian Bulletin, 1916, p. 118, the disease was briefly described as follows:—

"The disease occurs on both native and cultivated cotton. Leaves attacked by the fungus turn yellow or red in irregular

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* It may be noted, however, that Dr. Butler in his book "Fungi and Disease in Plants," p. 363, has recorded the occasional occurrence of a similar disease in Bombay.

areas, frequently at first bounded by the large leaf veins. Finally, the whole leaf is affected, turns yellow and drops off. The under sides of diseased leaves are covered with a white, shining mildew, there is also an internal mycelium in the tissues of the leaf. . . .

"The conidia are unicellular, large, and oblong with rounded corners; they are borne singly on short conidiophores.

"So far the disease has only appeared on old leaves which have passed their prime, in which case it simply hastens the fall. . . . In Montserrat, last year, it was said to be more serious."

Since this note was published the disease has been recorded from year to year, in varying intensity, but little work appears to have been done on it, and the fungus has remained unidentified.

Recently Mr. Nowell submitted to Kew typical specimens of this cotton mildew, and also of a somewhat similar mildew on *Tecoma leucoxylon*, with a request that they should be identified if possible.

Microscopic examination at once showed that both belong technically to the genus *Ovulariopsis*, Pat. and Har., which is distinguished from *Oidium* by its solitary or almost solitary conidia, and partly internal mycelium, and from *Oidiopsis*, Scalia, by the presence of external as well as internal mycelium. The question of specific identity, however, is one of some little difficulty.

Salmon* noted that the type species of the genus *Ovulariopsis*, *O. erysiphoides*, and also the later described *O. moricola*, Del., agree morphologically with the conidial stage of *Phyllactinia corylea*. He came to the conclusion that the genus represents the conidial stage of *Phyllactinia*, and that both the described species were identical with *P. corylea*. In support of this theory, he later† described the range of variation in the shape of conidia and conidiophores in this species, and distinguished certain well-marked varieties which are associated with particular host-plants.

In view of this known variability of the conidia, and the long list of host-plants already recorded for *P. corylea*, one hesitates to describe any Ovulariopsis as a new species.

On the other hand, the fact has to be taken into consideration that in neither of the present West Indian forms has any perithecial stage been observed. If it occurred, it is strange that it should not have been seen in so well known a disease as the cotton mildew. Climatic conditions could hardly be supposed to prevent the development of the perithecial stage, for *P. corylea* is known from both tropical and temperate South America.

In addition to the negative character of the absence of any perfect stage, the two forms under consideration possess fairly distinctive morphological characters, differing from those of *P. corylea*. In the case of the cotton mildew, the diseased areas of the leaf are very sharply marked. In the dried specimen they are almost black on the upper surface, and covered with a fairly dense powdery growth of mildew below. In no specimen of *P.*

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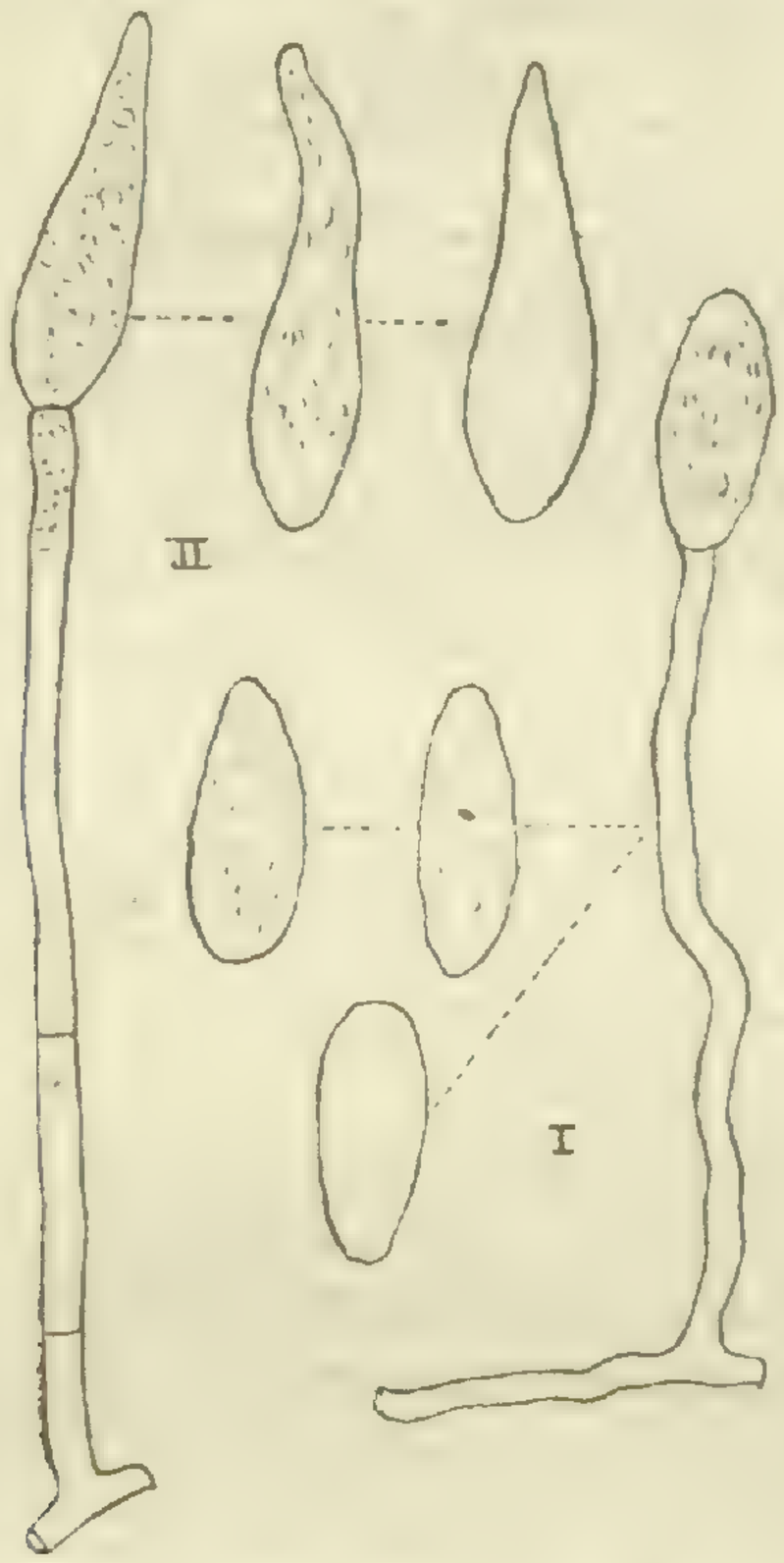
* Ann. Myc. ii. 1904, p. 438.
† Ann. Myc. iii. 1905, p. 493.

corylea have such marked effects on the host tissues been observed. The mature conidia are regularly oblong or elliptical, not clavate as in typical *P. corylea*. Salmon mentioned (loc. cit., p. 496) that he had observed conidia departing from the type on *Gossypium sp.*, but he does not appear to have described these further.

In the case of the mildew on *Tecoma leucoxylon*, the fungus also occurs more or less broadly effused on the under side of the leaf, but does not cause marked discoloration. The conidia here are almost all much narrowed towards the apex, and may reach over 90 μ in length, which is greater than any measurement recorded for *P. corylea.*



i. *Ovulariopsis Gossypii*, Wakef.
ii. *O. obclavata*, Wakef., × 250.

In view of these facts, it seems advisable, for the present at any rate, to give these forms distinctive names. Descriptions are therefore appended.

Ovulariopsis Gossypii, *Wakef.*, sp. nov.

Maculae amphigenae, e fulvo rubescentes dein atro-purpureae, irregulares, primo punctiformes demum late confluentes. *Caespituli* hypophylli, effusi, albido-farinosi. *Mycelium* hyalinum, pro maxima parte superficiale sed hyphis paucis per stomata in mesophyllum penetrantibus. *Hyphae* steriles repentes, tortuosae, parce septatae, 5–6 μ diametro: hyphae conidiferae erectae, flexuosae, 70–170 × 6–7 μ. *Conidia* acrogena, solitaria, oblonga vel elliptica, 50–60 × 16–22 μ, episporio laevi vel demum plus minus reticulato-rimoso.

Habitat. On old leaves of "Sea Island Cotton" (*Gossypium barbadense*) Barbados, April, 1920, *W. Nowell.*

Ovulariopsis obclavata, *Wakef.*, sp. nov.

Maculae indistinctae vel nullae. *Caespituli* hypophylli, effusi, albido-farinosi. *Mycelii* pars intramatricalis, pars superficialis. *Hyphae* steriles tortuosae, parce septatae, 5–6 μ diametro; hyphae conidiferae erectae, ad 220 μ altae, 8 μ crassae. *Conidia* acrogena, solitaria, obclavata, sursum magis attenuata, 66–94 × 20–24 μ, guttulata, episporio laevi vel rimoso.

Habitat. On leaves of *Tecoma leucoxylon*, Barbados, April, 1920, *W. Nowell.*

XXXVI.—AMOORA SPECTABILIS AND A. WALLICHII.

H. H. Haines.

The tree we are here concerned with is one described by Sir George King in the Journal of the Asiatic Soc. of Bengal, lxiv. p. 56, as *Amoora Wallichii* from specimens in the Calcutta Botanic Gardens undoubtedly named by Wallich *Sphaerosacme spectabilis* and taken from a tree originally brought from Goalpara in Assam.

Amoora spectabilis, Miq., is described in Ann. Mus. Lugd. Bat. iv. 37, also, as Miquel says, from a tree in the Calcutta Botanic Gardens called *Aglaia spectabilis*, the native country of which was unknown to him.

Hiern, in the Flora of British India, described what he considered to be *A. spectabilis*, Miq., from fruiting specimens collected by McClelland, near Rangoon, adding the characters of the flowers from Miquel's description of *Amoora spectabilis*.

King (l.c.) gives as synonyms for his *Amoora Wallichii* "*Sphaerosacme spectabilis*, Wall. MSS. in Herb. Calc., *Amoora spectabilis*, Hiern (*not of Miquel*) in Flor. Brit. Ind. i. 561," and he writes:—

"There has been some confusion in dealing with this plant. The description given is that of Wallich's own specimen (in flower) taken from a tree grown in the Botanic Garden, Calcutta, which had originally been brought from Goalpara in Assam . . . Miquel has described under the name *Amoora spectabilis*, a plant of which he says *Sphaerosacme spectabilis*, Wall. is the type. But Miquel's description does not fit Wallich's plant at all. Mr. Hiern, taking Miquel's name, *A. spectabilis*, describes under it a plant from Burmah which is certainly not Miquel's plant; but which may be the same as *Sphaerosacme spectabilis*, Wall."

It may be noted that Dr. Stapf considers King to have made an erroneous statement in saying that Miquel considered *Sphaerosacme spectabilis*, Wall., as the type of his *Amoora spectabilis*, because Miquel does not mention the name *Sphaerosacme spectabilis* at all. But probably all that King intended to convey was that Miquel believed he was describing the same tree as was called by Wallich *Sphaerosacme spectabilis* (= *Aglaia spectabilis*).

Neither King nor Miquel would appear to have seen Wallich's *S. spectabilis* at Kew. Wallich's No. 1277B, so named, resembles, and probably is, *Amoora Rohituka*, W. & A. It is not our plant. But there is another specimen of Wallich's, viz., No. 1278, also from Goalpara, called *Sphaerosacme Rohituka*, which is certainly the same as *Amoora Wallichii*, King. No. 1278 is quoted by Hiern (l.c.) under *Amoora cucullata*, but there are two species here under the same number, one being *A. cucullata*, the other *A. Wallichii*. Dr. Stapf has come to the conclusion that there has been a misplacement of labels, and that Wallich consistently called the tree under discussion *Sphaerosacme spectabilis*. As his note on this subject is of considerable interest it is reproduced below (p. 241), but the question to be decided here is whether, in the face of Sir George King's opinion quoted above, his *Amoora Wallichii* and Miquel's *Amoora spectabilis* are the same. The type of Miquel's species is not available. The Director of Kew has caused inquiries to be made for it, both at Leyden and at Utrecht, but it appears to be at neither of these herbaria.

The species, especially if the Andamans tree (see below) is conspecific, appears variable. Most of the Indian material dissected by me shows the teeth of the staminal tube rounded and only 8–9 half-exserted anthers, but King describes the teeth as acute (I think from the Andamans plant, which has acute teeth) and the anthers as 10, and some of my Duars specimens have shallow rounded teeth and 10 anthers. Miquel says "tubus urceolatus glaber dentibus 8 brevibus retusis; antherae 8 (an et 9?)."

King describes the panicles as bisexual, "the female flowers mixed with the males and exactly like them, but with a pyramidal prominently 3-angled tawny pubescent 3-celled ovary crowned by a stigma as in the male." In all the specimens seen by me the flowers are only *apparently* monoecious, and the female inflorescence is quite different from the male. No true female specimens are found in the herbaria, except in fruit. It is remarkable that if the panicles are really bisexual, as described above, that the fruits are always on very short racemiform panicles not more than 3–4 in. long, whereas the flowering supposedly bisexual panicles are diffuse and exceed one foot in length. A fruiting tree was therefore marked by me and flowering specimens subsequently collected from the same tree through the kindness of Mr. Haslett, in whose district it was growing. These, undoubted females, all turned out to be on short racemes, not or scarcely panicled, whereas a dissection of the panicled flower from another tree collected by Mr. Lace in the same locality (*Lace* 2501 marked *Amoora Rohituka*, Puri), has convinced me that, though the flowers are hermaphrodite in form, functionally they are not so, as the well-developed ovary has abortive or no ovules. A dissection of specimens from the Duars and Assam led to the same conclusion, and so did also a dissection of King's specimen collected in the gardens at Calcutta and supposed to have been one of Wallich's trees from Goalpara.

If Miquel's description of *A. spectabilis* and King's description of *A. Wallichii* are compared with one another, and with the

revised description of the tree given by me below, it will be seen that Miquel's does not differ much more than does King's from this revised description, which is based on a far larger number of specimens than these botanists had access to, and it appears possible, or even probable, that the tree grown in the Calcutta gardens, described by Miquel as *Amoora spectabilis*, was the same as the tree grown in the *same gardens* and called by Wallich *Sphaerosacme spectabilis* = *Amoora Wallichii*, King. Dr. Stapf states that he has no doubt that the two are the same, and therefore that the older name *Amoora spectabilis*, Miq., must stand.

Revised Description.

Amoora spectabilis, *Miq.* in Ann. Mus. Bot. Lugd. Bat. iv. 37; Hiern in Hook. f. Fl. Brit. Ind. I. (561, at least in part). Syn. *Amoora Wallichii*, King in Journ. Asiat. Soc. Bengal, LXIV. 56; *Sphaerosacme Rohituka*, Wall. Cat. no. 1278 (in part).

A tall handsome dioecious tree with a considerable trunk and a high crown. Sap of young parts milky; bark smooth, pale, blaze rather soft, streaked with brown and exuding drops of milky juice; twigs stout, rusty tomentose. *Leaves* crowded at the ends of the twigs 15 in. to 3 ft. long, odd-pinnate; rhachis stout, up to 22 in. long (with the petiole), grey or rusty with microscopic fimbriate scales and minute stellate hairs when young; leaflets opposite or subopposite, 9–19 or only 3–7 near the panicle, attaining 11 in. by 5 in. or terminal up to 14 in.; decreasing in size towards the base of the rhachis, terminal elliptic, lateral oblong or those at base ovate and somewhat reflexed, acute or acuminate with obliquely rounded base, secondary nerves spreading then upturned, 12–20 each side, distinct, often with small scattered rusty scales beneath, petioles $\frac{1}{2}$–$\frac{3}{4}$ in., of terminal leaflet 1–$1\frac{1}{2}$ in. long. *Male panicles* 9–22 in. long from the upper axils, inclined or suberect, very stout, with main branches $2\frac{1}{2}$–8 in. long, ultimate branchlets cymose with rather crowded flowers on very short rusty pedicels. *Flowers* subglobose, $\frac{1}{12}$ - $\frac{1}{15}$ in. in Orissa specimens, $\frac{1}{16}$ - $\frac{1}{8}$ in. in north-eastern specimens. *Calyx* saucer-shaped with 3 obtuse lobes rusty-tomentose. *Petals* 3, orbicular, concave, thinly tomentose on the parts exposed in bud. *Staminal tube* with a broad mouth and 8–10 rounded teeth or faintly crenate or (in the Andamans plant) with acute teeth; anthers scarcely or half exserted, connective incurved acute. *Pistillode* depressed-globose, tomentose, resembling the pistil of the female flower, but with fertile or rudimentary or no ovules. *Female panicles* sub-racemose, stout, $2\frac{1}{2}$–4 in. long, rusty. *Flowers* on very stout pedicels $\frac{1}{4}$ - $\frac{2}{5}$ in. long, supported by subulate bracts $\frac{1}{5}$ in. long. *Calyx* lobes 3–4 ovate. *Petals* as in the male, 3 or 4. *Staminal tube* as in the male; anthers well-developed with lateral slits, each containing a linear pollen mass. Ovary depressed, brown-tomentose, 3–4-celled with two superposed ovules in each cell; stigma very large, purple, 3–4-lobed. *Capsule* subglobose, 2 in. in diameter, 3–4-celled and 3–4-valved, with milky juice when unripe, tomentose. *Seeds* 1–4 with chestnut-coloured testa and scarlet aril; radicle transverse to axis of seed, plumule tomentose.

Distribution:—Throughout the plains and low hills of north-east India from the Sikkim Terai to Assam and Burmah; mountain valleys of Orissa, Mayurbhanj and Singbhum, extending to Ganjam in Madras; Andamans, *King* (but possibly different).

NOTE BY DR. O. STAPF.

King says (Mat. i. 57): "The description above given is that of Wallich's own specimen (in flower) taken from a tree grown in the Bot. Gard. Calcutta, which had originally been brought from Goalpara in Assam," and he quotes, among the synonyms, "*Sphaerosacme spectabilis*, Wall. MSS. in Herb. Calc." It is clear then, that King drew up his description (apart from the fruits) from an unnumbered specimen of Wallich's in the Calcutta Herbarium. That is no doubt the sheet which you say you recollect having seen at Calcutta. From his description it is evident that this specimen is a companion to the sheet marked "1278. 1. H.B.C." in Wallich's own herbarium, except that the latter also holds an inflorescence of *Amoora cucullata*. Now this sheet is without a ticket, and has merely the distribution number and H.B.C written in pencil in the left-hand bottom corner. On the other hand there is a label pinned on to a sheet written up in pencil (left-hand bottom corner) "1277 H.B.C." This label, in Wallich's writing, runs, "*Sphaerosacme* (*Aglaia?*) *spectabilis*, Wall.—H.B.C., Octob., 1824. E Goalpara introd^{a} ab amiciss^{o} Hamiltonio, M.D.," and across it, "If Roxburgh's *Andersonia* was tenable this would be a spec. thereof." To which is added in the centre of the label, in pencil, "1277." The plant on this sheet is *Amoora Rohituka*, a plant represented by several sheets in Wallich's herbarium under the name, "*Sphaerosacme polystachya*, Wall., in Herb. 1823."

It is, therefore, not to be assumed that the label beginning, "*Sphaerosacme* (*Aglaia?*) *spectabilis*," was intended for the plant with which it is at present associated in the Wallichian herbarium. It was very probably attached to it by accident, and received the number 1277 originally given to *Sphaerosacme polystachya* after it had become attached. But if it was not intended for *Sphaerosacme polystachya*, we can hardly escape the conclusion that it is the missing label of 1278 i. It was written in 1824, 4 or 5 years before the distribution numbers and the preparation of the catalogue. But if we transfer the label to sheet "1278 i.," the specimen which bears at present the label becomes unlabelled. Now there is among the sheets referred to *Sphaerosacme* by Wallich one, and only one, with two field labels. The plant mounted on it is *Amoora Rohituka* and the labels run (*a*) (left-hand top corner), "Ranna Pitrasa-Goalpara, 8 Septr., 1808," and (*b*) (right-hand top corner), "Ranna Pitrasa-Rishikund, 8 April, 1811." The specimen itself does not suggest that it is made up of two collections; in fact, the appearance of the several parts of which it consists, and especially the state of preservation, indicates its homogeneity. I am, therefore, inclined to assume that the left-hand corner label (Goalpara) was attached to this sheet by mistake, and was originally connected with the sheet now holding the "*Sphaerosacme spectabilis*" label. This

leaves 1277 C of the Catalogue with the Rishikunda* label and allows one field label for each of the sheets enumerated in the catalogue, whilst at the same time it makes Wallich's naming consistent. The confusion arose evidently, like many similar cases, when the distribution sets were made up. Sheet "1278, i." is quoted in the catalogue under "*Sphaerosacme Rohituka*, Wall.; *Andersonia Rohituka*, Roxb." This *Sphaerosacme Rohituka*, Wall., is really *Amoora cucullata*, and the quotation is correct as far as the detached large inflorescence of that sheet (left-hand bottom corner) is concerned. Otherwise it represents, as stated above, *Sphaerosacme spectabilis*, Wall. = *Amoora spectabilis*, Miq.

I may add that the tree of *Amoora spectabilis* in the Botanic Garden at Calcutta, from which Wallich took specimens in 1824, was most probably introduced there in 1808 when Hamilton stayed at Goalpara. Wallich's uncertainty as to the Roxburghian species of *Andersonia* is easy to understand. Although they are mentioned already in Hortus Bengalensis, 1811, they were then still undescribed. It was not until 1832 that the descriptions which Roxburgh drew up subsequently were published in Wallich's edition of Roxburgh's Flora Indica.

Whilst writing this note I came across a very fine drawing of *Amoora spectabilis* (*A. Wallichii*), in our collection of drawings. It is no. 351 of a set which was taken over from the East India Museum, and marked on receipt, "Royle, Carey & others." It is written up on the back, "*Sphaerosacme spectabilis*, Wall. *Aglaia? Milnea?*" and then, written at a later date, "This belongs to Roxburgh's *Andersonia*, which has since been superseded." All this is in Wallich's handwriting. On the front, there is written against 351 "*Sphaerosacme spectabilis*, Wall.," in Royle's hand. There is then no doubt as to what Wallich meant by *Sphaerosacme spectabilis*, namely the plant you are dealing with. Royle helped Wallich with cataloguing, and that may be how he got connected with the drawing, which is most probably one of Wallich's own collection. Unfortunately our list of Wallich's drawings breaks off with no. 208, after which there are only few entries with very much higher numbers (up to 835).

XXXVII.—JEFFERSONIA AND PLAGIORHEGMA.

J. Hutchinson.

In the Genera Plantarum, vol. i. p. 44, Bentham and Hooker united the genera *Jeffersonia*, Bart., and *Plagiorhegma*, Maxim., from the Eastern United States and North-East Asia, respectively. In making this reduction they remark:—

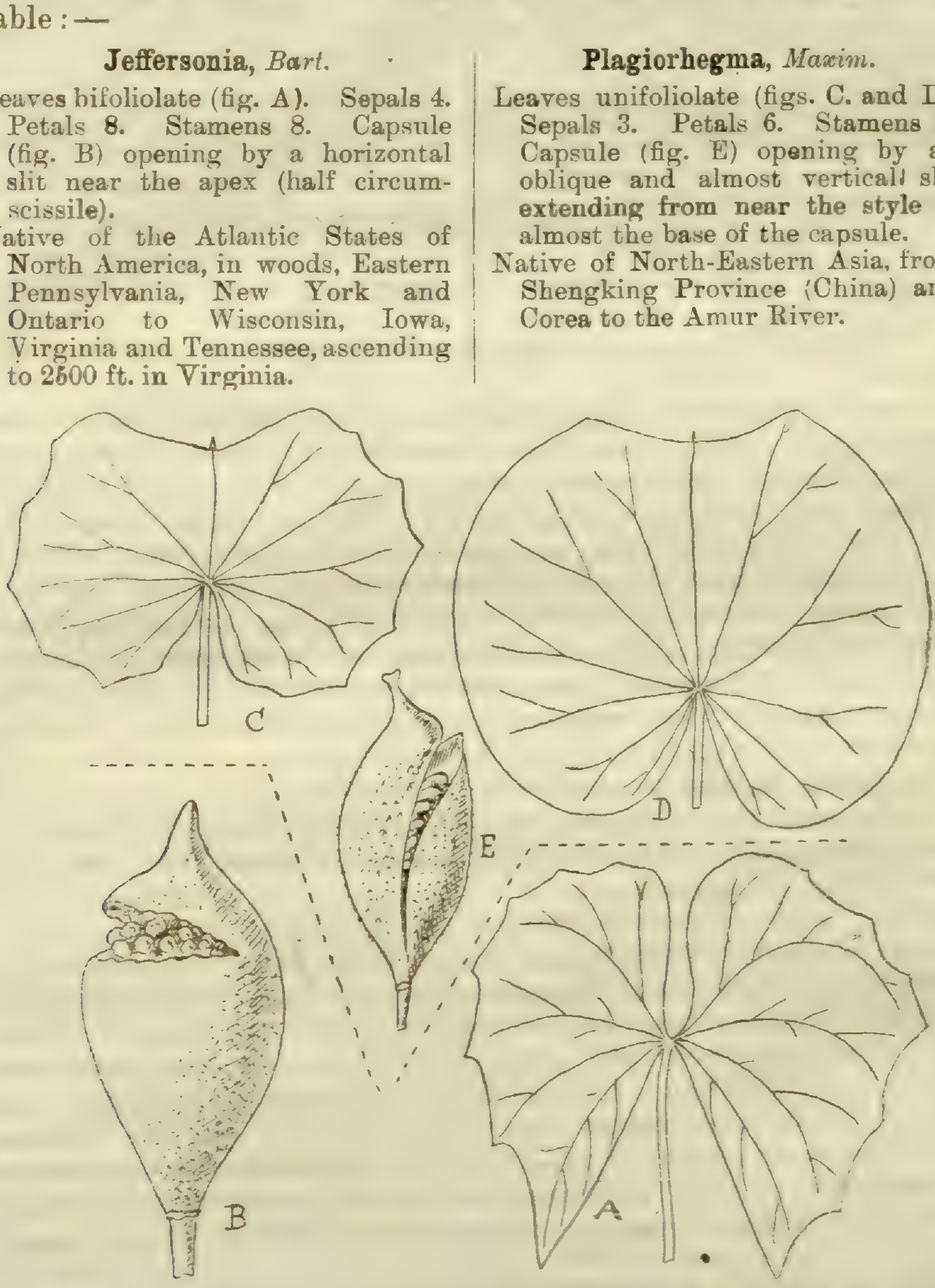
"Plagiorhegma, Maxim. Prim. Fl. Amur. 34, t. 1,† species Mantchuriensis, ex habitu et fructu certe *Jeffersoniae diphyllae* congener videtur. Flores adhuc ignoti, illi enim quos auctor dilapsos invenit descripsitque, ipso fatente abnormes erant."

* Rendered Rohilkund in the catalogue which is clearly an error. Hamilton was in Monghyr in 1811, and Rishikunda is near Monghyr.

† Should be tab. II.

It is true that Maximowicz had only a fruiting specimen before him when he described *Plagiorhegma*, and, in failing to discover any trace of stamens, he came to the erroneous conclusion that the flowers were unisexual. But I can see no reason for the statement that the flowers were abnormal. Maximowicz's figure is an excellent one and depicts *P. dubia* just like his type specimen, and as the plant grows in the Rock Garden at Kew. Subsequently flowering specimens were gathered in North-East China by John Ross, and were received at Kew in 1877, an additional specimen being received from the Petrograd herbarium in 1910. On dissecting these I find good differences in the flowers, as well as in the leaves and fruits as noted by Maximowicz. These differences are shown in the following table:—

Jeffersonia, *Bart.*	**Plagiorhegma**, *Maxim.*
Leaves bifoliolate (fig. A). Sepals 4. Petals 8. Stamens 8. Capsule (fig. B) opening by a horizontal slit near the apex (half circumscissile).	Leaves unifoliolate (figs. C. and D). Sepals 3. Petals 6. Stamens 6. Capsule (fig. E) opening by an oblique and almost vertical slit extending from near the style to almost the base of the capsule.
Native of the Atlantic States of North America, in woods, Eastern Pennsylvania, New York and Ontario to Wisconsin, Iowa, Virginia and Tennessee, ascending to 2500 ft. in Virginia.	Native of North-Eastern Asia, from Shengking Province (China) and Corea to the Amur River.



A and B, leaf and fruit of *Jeffersonia diphylla*; C, D, E, leaves and fruit of *Plagiorhegma dubia*.

These three important differences in the leaves, flowers and fruits, coupled with the separate geographical distribution, seem quite adequate for the re-establishment of *Plagiorhegma* as a valid genus. Bentham and Hooker no doubt paid little attention to the difference in the distribution because of the analogous cases in other genera of *Berberidaceae*,* some of which show a close relationship and ancient connection between the floras of North-Eastern Asia and North America, especially Atlantic North America. The following genera or species of *Berberidaceae* are common to these two areas:—

Podophyllum (*P. peltatum* in Canada and E. Un. States; five species in China and Himalaya).

Diphylleia (*D. cymosa*, high altitudes, Virginia to Georgia and Tennessee, and in Central and Western China; *D. Grayi* in Japan).

Achyls (Pacific N. Amer. and Japan; 2 very closely allied species, *A. triphylla*, DC., and *A. japonica*, Maxim., respectively).

Caulophyllum (*C. thalictroides*, Atlantic N. Amer. and N.E. Asia and Central China).

I give below a revised description of the genus and single species of *Plagiorhegma*.

Plagiorhegma, *Maxim.* Prim. Fl. Amur. 34, t. 2 (1859); *descr. emend.*

Herba polycephala, rhizomate perenni tenui suberecto foliorum basibus vaginantibus membranaceis costatis persistentibus induto. *Folia* radicalia, unifoliolata, longe petiolata, apice leviter et late biloba, basi cordata, palminervia. *Scapus* nudus, uniflorus. *Sepala* 3, petaloidea, mox decidua. *Petala* 6, plana, sepalis multo majora. *Stamina* 6, libera; antherae extrorsae, valvulis 2 sursum dehiscentes. *Ovarium* sessile, stylo brevissimo crasso in stigma cupularem undulate lobatum dilatato; ovula numerosa, ad ventrem circiter 5–6-seriata, adscendentia, anatropa. *Capsula* parva, coriacea, ab apice fere usque ad basin oblique dehiscens. *Semina* breviter arillata, arillo carnoso demum lacerato.

P. dubia, *Maxim.* l.c.

Jeffersonia dubia, Benth. et Hook. f. ex Baker et Moore in Journ. Linn. Soc. xvii. 377 (1879); Gard. Chron. lxiii. 149, fig. 68 (1918). *J. manchuriensis*, Hance in Journ. Bot. ix. 258 (1880).

Herba perennis fructifera usque ad 30 cm. alta; rhizoma tenue, suberectum, radicalibus fibrosis numerosis instructum, foliorum basibus vaginantibus membranaceis arcte indutum. *Folia* numerosa, longe petiolata, subreniformia, basi cordata, apice late bilobata, subanthesi circiter 3 cm. diametro et marginibus undulato-lobulata, maturitate multo majora et fere integra (minute denticulata), usque ad 10 cm. diametro, palmatim 9–10-nervia, nervis utrinque conspicuis multiramosis; petioli straminei, sulcati, glabri. *Pedunculi* floriferi 9–12 cm. longi,

* Excluding *Lardizabalaceae*, a distinct family included by Bentham and Hooker in the *Berberidaceae*.

fructiferi usque ad 20 cm. longi, sulcati, glabri. *Sepala* 3, petaloidea, mox decidua, oblongo-lanceolata, subobtusa, circiter 6·5 mm. longa, striata, glabra. *Petala* 6, obovata, 1 cm. longa, 6 mm. lata, ad basin angustata. *Stamina* 6, ovario aequilonga; filamenta complanata, 2 mm. longa; antherae 4 mm. longae. *Ovarium* 4 mm. longum, glabrum; stylus crassus, fere 2 mm. longus, in stigma cupularem undulate lobatum expanso. *Capsula* 1·4 cm. longa, carnosa, extra rugulosa, stylo persistente 3 mm. longo coronata. *Semina* brunnea, obovoidea, 3 mm. longa.

Manchuria: Lower Amur River, in pine forests near Pachale, fr., *Maximowicz*; near Vladivostok, fls., *Palczevsky* in *Herb. Komarov* 734. Corea: Chemulpo, fr., *Carles* 68. Shengking Province: shady wood, Fungshan, fls., *Ross* 29; wooded valleys, Corean Gate, fr., *Ross*. Mukden to Yaloo River, near Laoling, fls., *Webster* 136.

Vernacular name in Manchuria, *Kámbalta*.

Hance (see above) proposed the new name *manchuriensis* for *dubia*, because of the latter's unsuitability; a course, however, which we are unable to follow. For such a trivial reason the changing of specific names would have no end.

XXXVIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS XCIX.

981. **Xanthophyllum Burkilli,** *Drummond et Dunn* [Polygalaceae]; e speciebus adhuc cognitis vix ulli arcte affinis, floris magnitudine et structura ad *X. Schortechini*, King, aliquanto approximata ab ea ob filamenta pilosa, ovarium vix longe-stipitatum, folia chartacea aliasque notas facile distincta.

Arbor modicae altitudinis, ramis irregulariter flexuosis, cortice cinereo-albido. *Folia* lanceolata, ovato-oblonga vel elliptica, basi cuneata vel subrotundata, versus apicem subito acuminata, apice subobtusa, basi obscure quinquenervia, omnino glabra, superne virentia, subtus glaucescentia, duobus nervis marginalibus marginem subcrassam formantibus, lateralibus ad decem intra marginem anastomosantibus conspicuis pallidis, petiolis coloratis circa 7 mm. longis suffulta. *Flores* usque ad 1·6 cm. longi, in racemos cernuos circa 3·5 cm. longos paniculatim confertos dispositi; pedicelli puberuli, bracteolis cymbiformibus basalibus apice villosis circa 1·5 mm. longis muniti. *Sepala* 5, imbricata, inaequalia, pubescentia, posticum quam alia conspicue majus. *Petala* 5, omnia fere longitudine aequalia, sepalis 3–plo longiora, vix unguiculata, dorso carinata, carina versus basin angustata. *Filamenta* basi dilatata, pilosa, duo cum alis inferne connata, tertia petalo superiore plus minus adhaerens, caetera libera, stamina ad basin connectivi pilis satis longis ornata. *Discus* patelliformis, margine crenato. *Ovarium* distincte stipitatum, obverse turbinatum, sericeo-pubescens; stylus circa 3 mm. longus, subulatus, pilis sericeis instructus; stigma capitatum;

ovula ad octo, per duo series erecta, dissepimento incompleto imperfecte divisa.

Eastern Himalaya. Outer Abor Hills, Pasighat. *Burkill* 36767, 36864. The flowers appear to have been of a pale yellow or cream colour, deepening to gold brown on their backs and also on the sepals. Mr. Burkill notes "tree with young pendent lilac-flushed leaves." The species represents a new type in the genus of which it is at present the most northerly known representative. Two undescribed species collected by Lace in Burma (Lace 4756 and 4771) are allied, but the material is unfortunately insufficient for determination.

982. **Impatiens Beccarii,** *Hook. f. MS.* [Geraniaceae-Balsamineae]; *I. latifoliae,* Hook. f. et Thoms., affinis, sed floribus minoribus, alis dorso vix auriculatis, calcare incurvo distincta.

Herba erecta, glabra, 30 cm. alta; caulis simplex superne foliosus. *Folia* alterna, lanceolata, apice acuminata, basi acuta, 8–10 cm. longa, 3–4 cm. lata, serrata, subtus pallidiora, nervis 7–8-paribus; petioli 2–4 cm. longi. *Pedunculi* ex axillis superioribus 2–4-flori, 6–10 cm. longi; pedicelli 1–2 cm. longi, bracteis parvis lanceolatis basi suffulti. *Flores* calcare incluso 3–4 cm. longi, rosei. *Sepala* 2 lateralia ovata, acuminata, 6 mm. longa, 5-nervia, tenuia; posticum ex ore cymbiformi acuminato 1 cm. lato in calcar tenue semicirculare 2 cm. longum abiens. *Vexillum* orbiculare, ad 2 cm. diametro; costa breviter carinata. *Alae* 2 cm. longae, basi subito attenuatae; lobus basalis oblongus, distalis rotundatus, auricula dorsalis nulla. *Capsula* glabra, turgida, 1 cm. longa.

W. Sumatra. Province of Padang: Ajer mantjoer; 300 m., Aug. 1878, *Beccari*; Singubong, 2140 m., June 1903, *Micholitz*.

983. **Ixora monticola,** *Gamble* [Rubiaceae–Ixoreae]; species verosimiliter humilis, foliis parvis et cymis sessilibus insignis.

Frutex erectus, humilis, ramulis brunneis ultimis minute furfuraceo-puberulis. *Folia* tenuiter coriacea, lanceolata vel oblanceolata, apice acuminata, mucronata, basi attenuata, supra lucida, glabra, infra juventute puberula, deinde glabra, 4–8 cm. longa, 1·5–3 cm. lata; nervi utrinque 8–10, primum recti, denique curvati et arcuatim prope marginem juncti; petiolus gracilis, 5–8 mm. longus; stipulae ovatae, apiculo subulato munitae. *Cymae* sessiles, bracteis basalibus lanceolatis circiter 7 mm. longis; ramorum trium pedunculi circiter 1–1·2 cm. longi, in corymbum parvum multiflorum desinentes; corymbi 3 mm. diametro bracteolis multis linearibus muniti. *Calycis tubus* et lobi aequales circiter 1 mm. longi, furfuraceo-puberuli. *Corollae tubus* gracilis, 7 mm. longus; lobi breves, recurvi, minute puberuli, vix 2 mm. longi. *Stamina* reflexa, filamentis brevibus, antheris sagittatis. *Stylus* gracilis, glaber, exsertus, stigmatibus 2 patentibus. *Fructus* globosus, glaber, 5 mm. diametro, calycis lobis persistentibus coronatus.

South India. "High Wavy Mountain" near Cumbum, Madura District, at 300-1200 m. alt., May 1917, *Blatter and Hallberg*, 25, 254, 966 (in Herb. Calcutt.).

984. **Ixora Lawsoni,** *Gamble* [Rubiaceae-Ixoreae]; species distincta, calycis lobis linearibus ciliatis et cymis corymbosis maxime congestis fere capitula formantibus insignis.

Arbor vel frutex elatus, ramulis validis nodosis ultimis pubescentibus fere complanatis. *Folia* coriacea, glabra, ovata, elliptica vel oblongo-lanceolata, apice acuta et mucronata, basi rotundata, juniora aliquando attenuata, 8–16 cm. longa, 3–6 cm. lata; nervi laterales fere horizontales, utrinque 10–16, primum recti, deinde curvati et prope marginem arcuatim juncti, supra impressi; petiolus brevis, vix 5 mm. longus vel nullus, crassus; stipulae ovatae, apiculo dorsali longo subulato. *Cymae* terminales, corymbosae, maxime congestae, vix 4 cm. latae; pedunculus 0–5 cm. longus, bracteis ovatis foliaceis munitus; bracteolae permultae, lineares, conspicue ciliatae, 4–5 mm. longae, duae ultimae ad basim ovarii oppositae. *Calycis tubus* glaber, brevis; lobi 4, lineares, ciliati, additis aliquando 1–2 intermediis brevioribus, 4 mm. longi, persistentes. *Corollae tubus* cylindricus, gracilis, glaber, 8–13 mm. longus; lobi 4, ovato-oblongi, apice curvati, acuti, circiter 4 mm. longi, erecti vel patentes, fauce glabri. *Stamina* recurva, filamentis brevibus, antheris linearibus. *Stylus* gracilis, glaber, stigmatibus 2 gracilibus. *Fructus* globosus vel didymus, siccitate niger, glaber, ad 1 cm. latus, 6 mm. altus; pyrenae crustaceae. *Semina* peltata, excavata: embryo curvatus, 5 mm. longus, cotyledonibus cordatis foliaceis, radicula longa crassa infera.

South India. Coorg, *Wight* in Herb. Kew. Manantoddy, Wynaad, Malabar, about 1000 m. alt., Jan. 1884, *M. A. Lawson* 43. There is no indication on the sheets of this distinct species to show its size, but from the specimens it would seem to be a small tree. The colour of the corolla is not given.

985. **Ixora Saulierei,** *Gamble* [Rubiaceae-Ixoreae]; *I. Lawsoni*, Gamble, affinis, calycis lobis brevioribus sparse hirsutis, bracteolis filiformibus, inflorescentia haud congesta differt.

Arbor parva vel frutex, ramulis griseis scabris ultimis pubescentibus fere complanatis. *Folia* coriacea, elliptica vel elliptico-ovata, siccitate grisea, apice acuta, basi attenuata, supra glabra, subtus scabride pubescentia, 10–15 cm. longa, 4–6 cm. lata; nervi laterales angulo ad circiter 60° costam relinquentes, utrinque 10–15, marginem versus arcuatim juncti, reticulatione irregulari; petiolus brevis, crassus, 5 mm. longus; stipulae ovatae, scabrae, longe acuminatae. *Cymae* terminales, breviter (circiter 1 cm.) pedunculatae, bracteis 2 foliaceis 1 cm. longis ornatae; ramuli 3, conspicue complanati, pubescentes, corymbis parvis paullo congestis praediti; bracteolae filiformes, 2–3 mm. longae, hirsutae. *Calycis tubus* brevis, hirsutus; lobi lineari-lanceolati, hirsuti, 2·5 mm. longi, marginibus incurvis, persistentes. *Corollae tubus* cylindricus, gracilis, glaber, 1–1·5 cm. longus; lobi 4, oblongi, acuti, 4 mm. longi, reflexi, fauce glabri. *Stamina* recurva, filamentis brevibus, antheris linearibus mucronatis. *Stylus* gracilis, glaber, ramis stigmatosis 2 patentibus. *Fructus* didymus, siccí-

tate niger, glaber, 8 mm. diametro; pyrenae crustaceae. *Semina* peltata, excavata; embryo curvatus, cotyledonibus foliaceis.

South India. Pulney hills, *Revd. A. Saulière*, 637, 684.

986. **Coffea crassifolia,** *Gamble* [Rubiaceae–Ixoreae]; sectionis *Lachnostoma,* species *C. Khasianae,* Hook. f., affinis sed ramulis et foliis crassioribus, fructu ellipsoideo differt.

Frutex erectus, ramulis crassis, ultimis pallidis subtetragonis. *Folia* coriacea, elliptica, apice abrupte acuta, basi paullo attenuata, glabra, supra lucida, 8–10 cm. longa, 3–5 mm. lata; nervi utrinque 5–6, curvati et reticulatione siccitate prominente juncti; petiolus crassus, 5–10 mm. longus; stipulae triangulares, acuminatae, glabrae. *Flores* minimi, in cymis parvis axillaribus brevibus; pedunculus circiter 3 mm. longus; bracteae et bracteolae minimae, calyculum formantes. *Calycis limbus* brevis, truncatus, vix dentatus. *Corollae tubus* brevis, 2-3 mm. longus, intus villosus; lobi 4, oblongi, 2 mm. longi. *Fructus* ellipsoideus, glaber, 7–8 mm. longus, calycis tubo persistente coronatus. *Semina* 2, dorso convexa, intus paullo concava, utrinque rugosa, embryone minimo.

South India. Ayerpadi, Anamalai Hills, April 26, 1903, *C. A. Barber* 5474; Peermade, in Travancore, at 1500 m., Dec. 1910, *A. Meebold* 12860.

987. **Morinda reticulata,** *Gamble* [Rubiaceae–Morindeae]; *M. umbellatae,* Linn., affinis, calycis limbo carnoso conspicuo foliis coriaceis glabris lucidis et foliorum nervatione reticulata differt.

Frutex scandens, ramulis teretibus pallidis. *Folia* coriacea, glabra, lucida, oblanceolata vel lineari-oblonga, apice abrupte caudato-acuminata, basi attenuata, 8–16 cm. longa, 2–4 cm. lata; nervi laterales utrinque 10-12, paralleli, angulo circiter 60° costam relinquentes, deinde ad marginem curvati et nervis secundariis et reticulatione conspicuis juncti; petiolus 5-10 mm. longus; stipulae intrapetiolares tubum cylindricum pallidum formantes. *Florum capitula* terminalia, umbellata, pedunculis circiter 5 ad 1 cm. longis. *Calycis tubus* crassus, carnosus; limbus conspicuus, paullo elongatus, pulvini annulati ad instar, lobis 0. *Corollae tubus* brevis, intus villosus; lobi etiam breves, crassi. *Stamina* 4, ovata, inclusa, filamentis brevibus. *Ovarium* crassum, 4-loculare, ovulis 4; stylus brevis, lobis stigmatosis 2 rotundatis. *Syncarpium* carnosum, globosum, circiter 1·5 cm. diametro, e baccis inverse pyramidatis, pyrenis 4 cuneiformibus osseis triquetris. *Semina* oblonga, albumine carnoso, cotyledonibus minimis ovatis, radicula longa inferiori.

South India. Evergreen forests of Travancore, at Merchiston, 600 m. alt., April, 1895, *Bourdillon* 591; at Kulathurpolay, June, 1913, *M. Rama Row*, 1281.

988. **Psychotria Barberi,** *Gamble* [Rubiaceae–Psychotriae]; pyrenis quadrisulcatis, foliis membranaceis siccitate nigris late obovatis longe petiolatis insignis.

Frutex erectus, ramulis teretibus pallidis. *Folia* late obovata, apice rotundata, apiculo brevi acuto, basi cuneata, chartacea, glabra, 12–16 cm. longa, 5–9 cm. lata; nervi paralleli, utrinque circiter 15, primum recti, marginem versus curvati et arcuatim juncti; nervuli transversi, irregulares, distantes; petiolus crassus, 1·5–2 cm. longus; stipulae cylindraceae, truncatae vel fissae, extus rufo-pubescentes. *Cymae* terminales, breviter pedunculatae, brachiatae, rufo-pubescentes, fructiferae ad 9 cm. longae, 12 cm. latae; bracteae et bracteolae deciduae, minimae. *Calycis tubus* brevis, pubescens; lobi 5, lanceolati, patentes, acuminati. *Corollae tubus* 3–4 mm. longus, intus albo-villosus; lobi 1–1·5 mm. longi. *Antherae* inclusae, breves, filamentis subnullis. *Fructus* ellipsoideus, fere 1 cm. longus, siccitate niger; pyrenae dorso 4-sulcatae. *Semina* pyrenis conformia, sulcata, rugosa; cotyledones parvi, ovati; radicula inferior, crassa.

South India. Anamalai Hills, Coimbatore, at Udamanparai, May 15, 1903, *C. A. Barber* 5906. Travancore, at Pisga Camp near Munaar, 1500 m. alt., May 10, 1915, *K. Venkoba Row*.

989. **Psychotria globicephala,** *Gamble* [Rubiaceae–Psychotriae]; *P. Thwaitesii*, Hook. f., affinis, floribus in capitulo globoso aggregatis, calycis lobis late obovatis ciliatis, foliis angustioribus tenuioribus nervis plurimis inconspicuis differt.

Frutex erectus, ramulis teretibus pallidis glabris. *Folia* chartacea, oblongo-oblanceolata, apice abrupte acuta, basi attenuata in petiolum decurrentia, supra glabra, subtus juniora solum appresse puberula, 10–17 cm. longa, 3–5 cm. lata; nervi utrinque 12-18, haud conspicui, curvati et arcuatim inter se et cum nervis intermediis et nervo marginali juncti; petiolus crassus, circiter 1 cm. longus; stipulae late ovatae, acumine subulato et intus pilis rufis ornatae, cito deciduae. *Flores* parvi, in capitulo pedunculato globoso circiter 1–1·5 cm. lato aggregati; pedunculus 1–2·5 cm. longus. crassus; bracteae stipuliformes, crassae; bracteolae parvae, obtusae, deciduae, cum pilis multis rufis persistentibus mixtae. *Calycis tubus* brevis, campanulatus; lobi conspicui, late obovati, obtusi, ciliati, 2–3 mm. diametro. *Corollae tubus* cylindricus, latus, 3–4 mm. longus, intus villosus; lobi 1–2 mm. longi, reflexi. *Stamina* paullo exserta, antheris oblongis. *Stylus* vix exsertus, lobis stigmatosis obtusis. *Fructus* ignotus.—*P. Thwaitesii*, var. *peninsularis*, Hook. f. Fl. Brit. Ind. iii. 162, in part.

South India. Courtallum in Tinnevelly, August, 1835, *Wight* (Kew Distrib. 1440).

990. **Lasianthus cinereus,** *Gamble* [Rubiaceae–Psychotriae]; *L. dichotomo*, Wight, affinis, ramulis cinereis, foliis paucinerviis et pedunculis brevioribus differt.

Frutex erectus, ramulis cinereis appresse pubescentibus elongatis. *Folia* subcoriacea, elliptico-lanceolata vel oblongo-lanceolata, apice caudato-acuminata, mucronata, basi attenuata vel subobtusa, supra glabra, subtus praecipue ad nervos appresse pubescentia, 7–10 cm. longa, 2–3 cm. lata; nervi utrinque 3–4 cito

curvati, deinde apicem versus producti; nervuli transversi numerosi, prominentes, paralleli; petiolus 3–5 mm. longus, tortus; stipulae triangulares, cinereo-villosae, circiter 4 mm. longae. *Cymae* axillares, dichotomae, cinereo-villosae, pauciflorae, 1 cm. longae; pedunculus 5 mm. longus, aliquando brevior; bracteolae lineares, longissimae. *Calycis tubus* brevis; lobi 4, lanceolati, 4 mm. longi, appresse villosi, apice setosi. *Corollae tubus* brevis; lobi oblongi, utrinque villosi. *Fructus* glaber, apice depressus, 4 mm. diametro, siccitate niger.

South India. Kalivayalpil, Tinnevelly, May 31, 1901, *C. A. Barber* 3014; Kannikatti, Tinnevelly, June 9, 1899, *ib.* 454; near Naterikal, Travancore boundary, March 4, 1917, *K. Rangachari* 1450.

XXXIX.—MISCELLANEOUS NOTES.

John Chisnall Moore.—We record with regret the death of Mr. J. C. Moore, late Superintendent of Agriculture, Grenada, on May 5th, at Old Woodstock, Oxon.

Mr. Moore entered the Royal Botanic Gardens, Kew, in December, 1893, and left in June, 1895, on his appointment to the Curatorship of the Botanic Station, St. Lucia (*K.B.* 1895, p. 155). In the year 1898 he was made Agricultural Superintendent of that island, when the Agricultural Department was re-organised. He held the post until 1914, when he was transferred to Grenada as Superintendent of Agriculture (*K.B.* 1914, p. 345), and owing to failing health he retired on pension in 1919 (*K.B.* 1919, p. 447). Mr. Moore had only recently returned to enjoy his retirement in England.

Sapindus trifoliata, *Linn.* **or S. laurifolia,** *Vahl.*—It has been observed that the former name, which was used by Hiern in the Flora of British India, vol. i. p. 682, has been superseded in Trimen's Handbook of the Flora of Ceylon, in Cooke's Flora of the Presidency of Bombay, and in other works, by *S. laurifolia*, Vahl, and an attempt has been made to ascertain whether there is any good reason for the change.

Vahl himself treated *S. trifoliata* as a synonym of his *S. laurifolia*, adding in a note: "Cur trifoliatam auctores hanc dixerint, facile non liquet, cum folia pinnata uti ex figura descriptione Rheedii apparet l.c.; nomen triviale igitur utpote quam maxime incongruum mutavi." Trimen (Handb. Fl. Ceyl. i. 306), adopting Vahl's name, says: "Hiern in Fl. Brit. Ind. gives the name *S. trifoliata*, L., to this [*S. laurifolia*] and the next [*S. emarginata*] combined. The name is an absurd one, as neither plant is trifoliate. Moreover, the plant so called by Linnaeus is the 'Conghas' of Hermann, which, as above noticed, is *Schleichera trijuga*. Linnaeus afterwards added a quotation of Rheede's figure, and hence his name has got transferred to the present species; but it should not be maintained." Under *Schleichera trijuga* (l.c. p. 304) Trimen again states that it is the

'Conghas' of Hermann and quotes Herm. Hort. Lugd.-Bat. 536, Herm. Mus. 69, Burm. Thes. 209 and Linn. Fl. Zeyl. n. 603.

Now what are the facts? In Flora Zeylanica, p. 231, Linnaeus includes "Conghas" among his "Barbarae. Annihilatae," and writes "Conghas Herm. Zeyl. 69. *Saponaria arbor zeylanica trifolia, semine lupini.* Herm. mus. 69, prodr. 373, Burm. Zeyl. 209," etc. Subsequently, in Species Plantarum, ed. i. 367, against *Sapindus trifoliata*, he writes, "*Sapindus foliis ternatis,*" and quotes Rheede's Hortus Malabaricus, iv. p. 43, t. 1 only, not at all referring to Flora Zeylanica. So far then there is nothing to show that he meant the same plant in the two cases.

Linnaeus quotes no number of Hermann's Herbarium as he does in other cases where he describes and names a plant in that Herbarium. Nor is there a specimen of "Conghas" in Hermann's Herbarium, or one of *Saponaria . . . trifolia* in Linnaeus'. Hermann himself, as Dr. Rendle kindly pointed out to me, included "Conghas" among his species not properly known, and all he says about it is: "*Saponaria arbor Zeylanica trifolia semine lupini. Conghas Zeylanens. Saponaria Sphaerulae arbor Lugd. Nuculae Saponariae non edules.* C.B.P." This as far as it goes applies as well to *Sapindus* as to *Schleichera*, or even better.

In the case of Burmann's "Conghas" the evidence available is less ambiguous. This is what Burmann (Thes. Zeyl. 209) says:— "Saponaria arbor, Zeylanica, trifolia, semine Lupini. *Par. Bat. Pr. pag.* 373. *Mus. Zeyl. pag.* 69. Saponaria arbor, trifoliata, Zeylanica. *H. Beaum. pag.* 37. Saponaria arbor, Indica. *Amm. H. Bosian. pag.* 32. Saponaria arbor trifolia, Indica, *H. L. Bat. pag.* 536. & *Commel. Fl. Malab. pag.* 60. ubi jungitur cum Prunifera fructu racemoso, parvo, nucleo saponario. *Ray hist. pl. pag.* 1548, huc spectat Purinsji *H. Malab. part.* 4 *Tab.* 19. ubi *pag.* 44. *in notis* vide varios fructus, quibus Indi saponis loco utuntur. an Arbor Prunifera, sphaerulas saponarias ferens, tetraphylla, ex India Orientali. *Plukn. Phyt. Tab.* 14. *Fig.* 6? & *Almag. pag.* 47. Conghas nostra Zeylonensibus dicitur." All the references additional to Hermann's point rather to *Sapindus* than *Schleichera*. In support of that it may be added that Commelin calls the tree "Seepnoten," whilst Ray not only refers to it as the "Soap Tree," but also gives a description of the flowers which leaves no doubt that he is dealing with a *Sapindus* and not with a *Schleichera*. Burmann also quotes the Purinsji of Rheede (H. Malab. iv. t. 19). This, however, is the basis of the *Sapindus trifoliatus* of Linnaeus, who evidently knew it only from that source there being no specimen in his herbarium. This figure of Rheede's is good, and considered in conjunction with his description there is no doubt that it represents Vahl's *Sapindus laurifolia.*

The "Conghas" of Hermann is therefore, presumably, and that of Burmann, certainly, a *Sapindus*, and both are probably identical and correspond to *Sapindus trifoliatus*, Linn., or the synonymous *Sapindus laurifolius.*

As regards the unsuitability of the name "*trifoliatus,*" this cannot prevent its being used, and it is after all no less suitable

than many other names admitted; one leaf in Rheede's figure is trifoliolate, and on the other hand "trifoliata" may refer to the frequent occurrence of three pairs of leaflets; moreover, seedlings have actually ternate leaflets. Lastly, *Schleichera* is no more trifoliolate than is *Sapindus*.

It is a point of interest, not that it affects the argument, that Radlkofer, who paid special attention to the *Sapindaceae*, also refers to S. *trifoliata* as a synonym for *S. laurifolia*. I think therefore that the name *Sapindus trifoliata* should be restored in systematic works in the place of *S. laurifolia*.

H. H. HAINES.

Sesbania sericea as a green manure crop.—We have received the following letter from Mr. J. Sydney Dash, Director of the Agricultural Station, Guadeloupe, West Indies:—

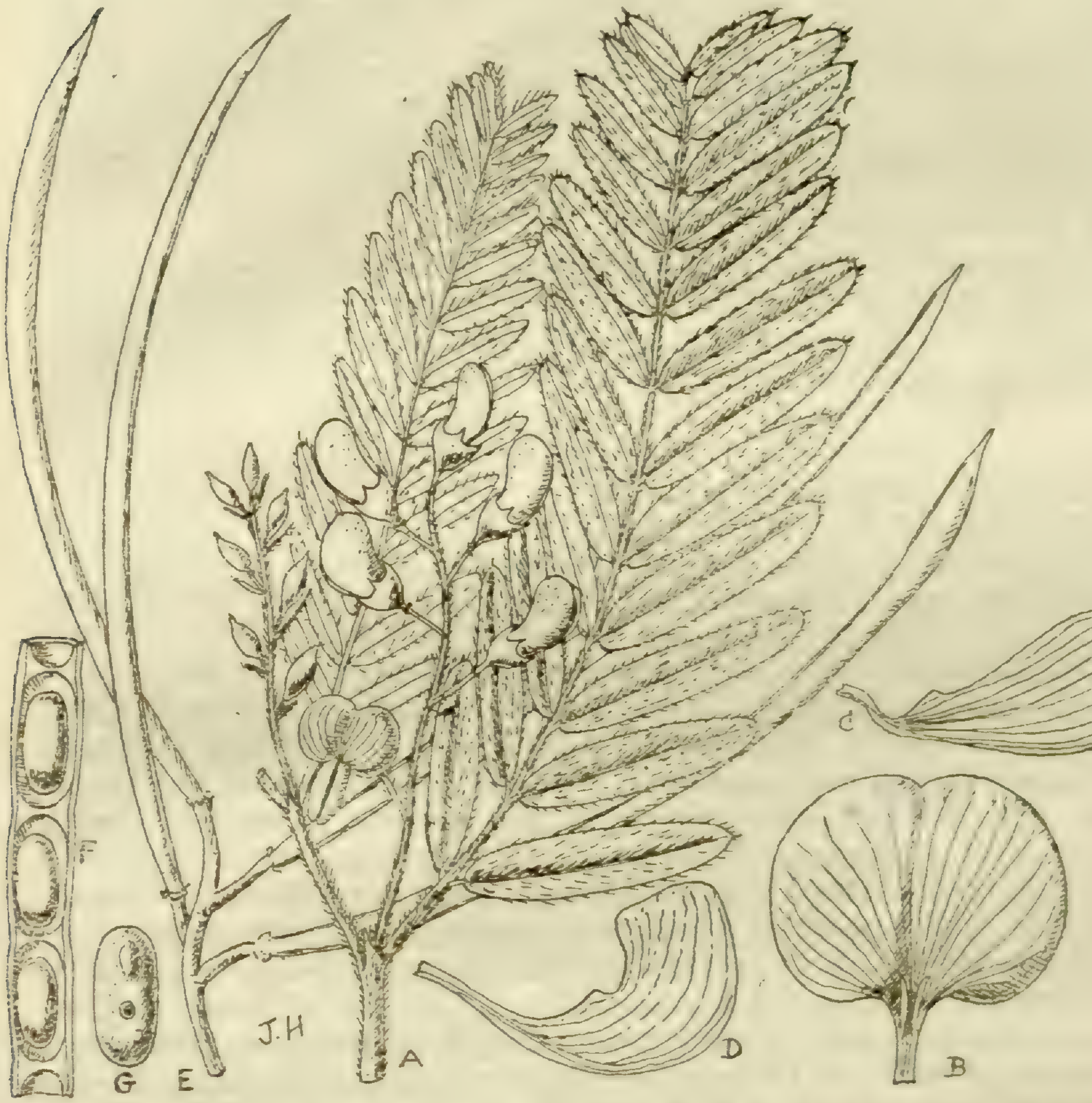
"I am forwarding you specimens of a leguminous plant which I found growing wild on an islet in the harbour of this town, and which I have under experimental cultivation as a possible green-manure crop. The nodules which form on the roots are, in size and quantity, superior to those of any other leguminous plant with which I am acquainted. It seems to be capable of reaching a height of four feet or more in good moist soil. At this stage, of course, it has a tendency to become woody. If employed as a green manure crop it would be well to turn it in before it gets too old. Sown thickly, it will produce a heavy yield of green material when two to two-and-a-half feet high. At this time an analysis of the plant was made in our laboratory, and I enclose a copy of the results, from which you will see that the nitrogen content is very high."

	Stems.	Roots.
Moisture	69·17	
*Albuminoids	3·69	
†Amides	1·39	
Mucilage	3·50	
Cellulose	5·80	
Woody fibre	14·27	
‡Ash	2·18	
	100·00	
*Containing nitrogen	0·59	
† ,, ,, ...	0·25	
*†Total nitrogen	0·84	0·83
‡Containing phosphoric anhydride (P_2O_5)	0·24	0·29
‡ ,, potassium oxide (K_2O)	0·20	0·20

Kilos per hectare.

		N.	P_2O_5	K_2O
Stems	14,103	118	34	28
Roots	1,710	14	5	3·5
Totals ...	15,813	132	39	31·5

The plant proves to be *Sesbania sericea*, DC., a leguminous herb characterised by silky leaflets and straight very narrow pods. In the Herbarium there are specimens from the following places: West Indies: Porto Rico; sea shore at Mayaguez (*Sintenis* 61); moist fields near Anasco (*Sintenis* 5594). Jamaica; on the road from Kingston to Spanish Town (*Harris* 9051). Bahamas; near Nassau (*A. H. Curtiss* 160). British Guiana: sea shore (*Jenman* 4538). French Guiana: Cayenne (*Sagot*). According to Urban (Symb. Antill. iv. 286) it occurs also in Hispaniola, St. Thomas, Antigua, and Martinique. A single gathering has also been made in Ceylon, near Colombo (*Ferguson*).



A, portion of *Sesbania sericea*, $\frac{2}{3}$ nat. size; B, C, D, standard, wing, and keel petals, respectively, enlarged; E, infructescence, $\frac{2}{3}$ nat. size; F, fruit laid open; G, seed; enlarged.

There is besides, on the West Coast of Africa, what appears to be almost an identical species named by De Candolle *Sesbania pubescens*. It occurs in marshy places from Senegambia to Lake Chad, and on the shores of the island of St. Thomas. Should *S. sericea* prove useful as a green manure in the West Indies, no doubt *S. pubescens* would serve the same purpose in Africa.

In Western Australia there is also a plant which scarcely seems

specifically distinct from *S. sericea*, named by Bentham in the Flora Australiensis (ii. 213) *S. aculeata*, Pers., var. *sericea*. It is recorded from Flinders River (coll?), Sturts Creek (*von Mueller*). Depuch Islands (*Bynoe*), and between the Ashburton and De Gray Rivers (*Clement*).

The accompanying text figure of *Sesbania sericea* should give cultivators some idea of the appearance of the plant. J. H.

New Zealand Plants and their Story, L. Cockayne.—The second edition (1919) of this well-printed and well-illustrated book, published as Manual No. 1 by the New Zealand Board of Science and Art, is virtually a new work. It presents a connected account of the vegetation of New Zealand and must form an indispensable complement to Cheeseman's "Manual of the New Zealand Flora" for a botanist studying the vegetation of the progressive Dominion. There are 99 photographic reproductions in addition to text-figures.

The vegetation is chiefly considered from ecological and phytogeographical standpoints. The first chapter deals with the history of botanical exploration in New Zealand, and the only prominent name we miss is that of Dr. Cockayne himself. A second chapter forms an introduction to the ecology of the country and contains a clear exposition of the commoner terms used in its study and a suggestive classification of growth-forms. Following chapters deal with the flora of the sea-coast, forests, lowland, heath and rock vegetation, plants of inland waters, swamps and bogs and the flora and vegetation of the outlying islands. A chapter entitled "The evolution of a new flora and vegetation," records the influence of man and his domesticated animals on the vegetation, and another gives in outline a classification of New Zealand plants, carefully explaining the principles on which it is based. The penultimate chapter deals with the distribution of the plants in New Zealand, and includes a brief account of each of the 15 botanical districts into which the author has proposed to subdivide the country. The final chapter, dealing with the affinities, origin, and history of the flora is, perhaps, the most interesting in the book. It is pointed out that New Zealand species fall, according to their origin and affinities, into one of the six following groups: endemic, Australian, Fuegian, Malayan, European, cosmopolitan. Of the estimated 1780 species of Vascular Plants constituting the flora 74 per cent. are endemic, while of the dicotyledons and conifers 85 per cent. are endemic. 290 species are common to New Zealand and Australia and 23 species to New Zealand and Fuegia, while about 20 other New Zealand plants have very closely related forms in Fuegia. The Malayan element, except in Vascular Cryptogams, makes itself felt in the joint possession of certain genera rather than of species. The European element is small and the cosmopolitan chiefly tropical and subtropical. In summarising the evidence the view taken is that New Zealand possessed a primitive flora of her own—the Palaeozelandic—which probably formed part of that of a wide

land-area, perhaps united to Antarctica; that at an early date the ancestors of the present subantarctic element came in; that later there was an invasion of tropical Malayan species, and perhaps also of the Australian element. W. B. T.

Botanical Magazine.—The following plants were figured in the number for October, November and December, 1919:—*Baikiaea insignis*, Benth. (t. 8819), from Tropical West Africa; *Atraphaxis Billardieri*, Jaub. et Spach (t. 8820), a native of Greece and the Levant; *Primula spicata*, Franch. (t. 8821), from Western Yunnan; *Cotyledon oppositifolia*, Ledeb. ex Nordm. (t. 8822), from the Caucasus; *Euonymus alatus*, Regel (t. 8823), a native of North-Eastern Asia; *Thorncroftia longiflora*, N. E. Brown (t. 8824), a native of the Transvaal; *Sigmatostalix costaricensis*, Rolfe (t. 8825), from Costa Rica; *Rosa glutinosa*, Sibth. et Sm. var. *dalmatica*, Borbas (t. 8826) from Dalmatia; *Campanula sulphurea*, Boiss. (t. 8827), a native of the Orient; *Haworthia Chalwini*, Marloth et Berger (t. 8828), from South Africa; and *Gaultheria cuneata*, Bean (t. 8829), a native of Western Szechuan. The volume for the year is dedicated to Mr. E. H. Wilson, V.M.H., Assistant Director of the Arnold Arboretum, "Whose ardour as an Explorer and judgment as a Collector have added to our Gardens many Eastern Asiatic plants whose portraits embellish the Botanical Magazine."

The Dwarf Coconut.—The following note is extracted from an article on "The Dwarf Coconut," by Mr. W. P. Handover, in the Agricultural Bulletin of the Federated Malay States, No. 5, 1919, pp. 295–297. "The dwarf coconut known in this country as 'nyiur gading' is remarkable for its early fruiting, palms only 10 ft. high bearing abundant fruits touching the ground. The young palm grown under good conditions starts to flower in its third year and produces ripe fruit in about nine months from the appearance of the flower spike. The initial flower spikes contain only male flowers, but other spikes appearing in rapid succession are larger and bear an increasing number of female flowers also, a spike from a six year old tree being counted with 200 young female flowers, whilst trusses of fruit from similar trees have been found with as many as 55 ripe nuts. It is generally of a bright yellow colour, and Winstedt in his quotations from Malayan Folk Lore speaks of 'nyiur gading,' the golden coconut only to be found in the Princes' Gardens.

"Five hundred nuts to a picul ($133\frac{1}{3}$ lb.) of copra is a general average yield. With the leaf length only 12 ft. it was found convenient to plant the palms 24 ft. by 20 ft., which gave 90 to the acre, a number nearly double to that required when planting big palms. In the fifth year the trees yielded 30 nuts apiece, so that 2,700 nuts would be obtained from trees planted 90 to the acre, while in the ninth year, which is the sixth yielding year, 120 nuts were yielded per tree in full bearing, making 10,800 nuts per acre or $21\frac{3}{5}$ piculs of copra per acre. The big coconut does not produce till after its fifth year, but in the ninth year 45 trees per acre would probably yield 40 nuts apiece or 1800

nuts per acre, giving 8 piculs of copra per acre. The nuts of the dwarf trees can be easily and rapidly picked and also inspected for beetles and other pests. Almost $2\frac{1}{2}$ times the number of nuts per picul of copra have to be handled as compared with the larger nuts, but it is suggested that this may not be of great consequence when working with newly devised methods and machinery, dealing with large quantities."

Catalogue of the Library.—The first printed Catalogue of the Library of the Royal Botanic Gardens, Kew, was published in 1899, and is a volume of nearly 800 pages, forming Additional Series III to the *Kew Bulletin*. Since its appearance an annual supplement, including the accessions for each year, has been published as an appendix to the *Bulletin*. The first supplement forms Appendix IV to the volume for 1899 and the last issued, comprising the additions received during 1915, forms Appendix II to the volume for 1916. There are consequently 19 supplements, and the need for consolidating these was obvious. It was decided therefore to re-issue in one supplement all the additions to the library received since the catalogue was published, and the work of arrangement and revision was completed in the autumn of 1915 when, however, owing to difficulties arising from the war, it could not be printed. It was not possible therefore to send it to the press till last year, and as the usual annual supplement to the catalogue was suspended after that for 1915, the additions received after that year have been omitted and will form another supplement, to cover the years 1916–20, which, it is hoped, will be published next year. Like the original catalogue the supplement is printed on one side of the paper only, and the same arrangement of the entries into 4 sections (I. General, II. Travels, III. Periodicals, and IV. Manuscripts) has been followed. The volume consists of 433 printed pages, is priced at £1 net, and is sold by Messrs. Gale & Polden, Ltd., Royal Botanic Gardens, Kew. It should be mentioned that additions to sets of periodical and serial works which appear in the original catalogue are not included in the supplement, nor, as a rule, are excerpts from periodicals and other publications received in the library, though such excerpts are welcomed and are often found of much use as "tracts," in which collection they are placed and are easily found without the aid of the catalogue.

In the annual notes on presentations to the library, published in the *Kew Bulletin*, it has been the practice to mention the more important additions received as such during each year. From these notes it will be seen that the establishment is indebted to a wide circle of authors, publishers and other persons, to governments of various countries, to botanical, agricultural and other institutions, as well as to an annual grant from H.M. Stationery Office, for the means of maintaining its library, the efficiency of which is of paramount importance. It is not possible, nor necessary, to give details here of the many valuable presentations which are included in this supplement. It may, however, be stated that the greater number of the works by authors before the time of Linnaeus have been presented by the Bentham Trustees.

S. A. S.

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FIG. 1.—The Grove of *Quercus Calliprinos* near Kebara, one mile from Enab in the Judean Hills, from a photograph taken in 1918.

FIG. 2.—Abraham's Oak (*Quercus Calliprinos* [Sindian]), from a photograph taken by Col. Robins, D.P.M., for Major Portal in 1918.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8] [1920

XL.—ABRAHAM'S OAK.

M. Portal.

(With Plate.)

With reference to the note in the *Kew Bulletin*, 1919, p. 233, on Abraham's Oak, *Quercus coccifera*, var. *palaestina*, Boissier, I send a photograph of Abraham's Oak taken for me in 1918 by Col. Robins, D.P.M., E.E.F., after the capture of Jerusalem. This venerable tree is, as the photograph shows, protected by an iron railing, and its condition might be considerably improved could it receive the attention of a skilled forester.

The great rarity in Palestine of *Q. calliprinos** of any size is attributed to two causes—(1) perpetual grazing by flocks of goats on hillsides, (2) the scarcity of trees for fuel or building, combined with the methods adopted by the Turk for the raising of money. As one enters the pass up towards Jerusalem, one notes, climbing the mountain sides, numberless small plants of *Q. calliprinos* growing out of clefts in the rock, eaten close to the rock face by the flocks of goats, herded by small hill children. This has gone on for many hundreds of years, and thus the oak has never had a chance of developing.

It is difficult to explain how these small oaks have become established in the places where they now exist in the Judean hills, as no trace of an acorn-bearing tree or bush is to be found except near Enab, a considerable distance away. It is however, worthy of note that the Syrian jays are very fond of carrying away acorns in the cups from the clump near Enab, afterwards sitting on the top of a flat rock, trying to pick the acorn out. In that way some may drop out and fall in the clefts between the rocks. It is possible also that the herd boys may pick up a number of the acorns under the clump when they bring the goats down to eat the fallen ones, and take them away as playthings and drop them.

* This name is used here in preference to that given in the note referred to above for reasons stated in the article (No. XLI.), which follows.

(1076.) Wt. 135. -P. 47. 1,000. 9/20. J. T. & S., Ltd. G. 14. Sch. 12.

The Turk, desiring always to raise taxes with the least amount of trouble, puts a tax of £E1 per tree on certain trees of any size. A notable example of the effect of this tax is that of the Olive forest formerly existing between Gaza–Ascalon and Mejdel, still shown on our maps as "Olive forest."

When the advance came I went to see this "forest," but found only very large Olive tree stools, the whole having been cut down by the owners and the wood sold, thereby avoiding the annual tax of £E1 per tree!

An oak forest of considerable size is shown on the maps of 1878 behind El Jelil marshes, some 17 miles north of Jaffa, but this also has vanished, and, though some fair-sized tree stools remain, the rest is scrub and of no size. A better collection of *Q. calliprinos* existed recently near Zimmarin, about 20 miles south of Mount Carmel, but only scrub now remains, the Turk having cut the larger trees or saplings for firewood. At the dump I saw no log exceeding 12 in. in diameter. On the slopes of Mount Carmel this oak forms certainly four-fifths of the scrub, and one sees many bushes with thick branches 8 or 9 ft. long, growing out of the rocks on hill sides, in many cases bearing acorns. But these slopes are in many parts too steep even for goats, and no flocks appeared there such as we saw on the Judean hills. The oak forest below Zimmarin starts. apparently, where cultivation ceases, and extends up the lower foothills and eventually round the spurs of hills to the Carmel range, but never actually reaches the hill tops.

There is no reason why, in the fertile soil and good climate of Palestine, groves of *Q. calliprinos* and other trees should not be grown again and protected under Government supervision. It is particularly noticeable how successfully the German-Jewish Colonies have planted trees, usually Eucalyptus. The growth these have made in a comparatively short time is remarkable.

The country badly needs re-afforestation, which would, under proper care, soon be a paying proposition. The chief enemy would be the herds of goats or sheep, but these could be fenced off with barbed wire. On rare occasions flights of locusts occur which consume most of the green things they meet, but I did not see any *Q. calliprinos* scrub or Eucalyptus which showed signs of former attack by them. Palm trees, Olive trees and, of course, Almond trees had suffered severely, and in gardens which had been left to run wild the trees were often in a dying condition.

XLI.—THE BOTANICAL HISTORY OF THE 'SINDIAN' AND THE AGE OF ABRAHAM'S OAK.

O. Stapf.

The nomenclature of the species of *Quercus* to which the famous Abraham's Oak belongs is somewhat confused, partly owing to its having been described several times over, and partly on account of the broader or narrower view of the species which successive writers have applied to the group of which it is a member. The

following lines are intended as a contribution towards a clearer and, at the same time, practical concept of the type of oak in question.

As the Arabs of Palestine have long known it by the name "Sindian," we may, for the sake of greater clearness, speak here of it as the Sindian Oak, and thus keep it distinct from the Kermes Oak of South Europe and North Africa, with which it is frequently associated. Both belong to the "*coccifera*" group, *Quercus coccifera* being the name originally applied by Linnaeus to the Kermes oak. These "*Cocciferae*" represent a type of evergreen oak, widely distributed over the whole of the Mediterranean region from the Atlantic to the Levant. They form a characteristic element of the "maquis" or "macchie," that is, the scrub-formation of the coastland of the Mediterranean, ascending here and there in the adjoining mountain ranges to altitudes of up to over 4000 ft. Mostly shrubs from a few to 10 ft. high, they grow occasionally into small trees up to 20 ft. high, or, as in the eastern section of the area, into quite stately trees. The small, hard evergreen and mostly spinous leaves vary in size, shape and the degree of spinosity in the same individual, or in the individuals of a given colony, or, as it appears, from race to race. The fruits show a similar range of variation with regard to size, shape of the phyllaries or scales of the cupules, the length of the acorns relative to that of the cupule, and the time they take to mature. Here the variation is partly of the nature of response to conditions of nutrition or possibly age, individual fluctuation, or of a fixed character indicating the presence of distinct generic units. This partly real and partly apparent instability of the characters which challenge discrimination is very difficult to appreciate in detail, and apt to lead to one of the two extremes of taxonomic treatment, excessive "lumping" or excessive "splitting." Both have had their apostles. The conception of one extremely "variable" or polymorphic *Q. coccifera*, covering the whole group, is contrasted with the creation of almost a score of species proposed in the course of time for this same group. In either case it seems that too much has been merely assumed, and it will require prolonged observation and experiment to disentangle the stable and the unstable element in this apparent chaos of forms. No attempt in that direction is made here, but, viewing the material at my disposal, I have come to the conclusion that so far only one type of the *coccifera* group is known to exist in Palestine. It occurs either as a shrub or a tree of varying and occasionally considerable size; it has leaves, no doubt, of variable size, but on the whole larger and more oblong than those of the Kermes oak, and its fruits have large to very large cupules with rather long linear- or lanceolate-oblong phyllaries or scales, mostly free from the middle upwards and erect or more or less recurved and covered with a fine greyish down. This oak is a common, if not the most common, constituent of the scrub or the maquis formation which occurs all over the southern and western slopes of the Judean plateau from the latitude of Hebron to Mount Carmel, entering here and there deeply along the valleys into the

latter, then covers much of the hills around the plain of Esdraelon, and finally continues northwards, facing on one side the Phoenician plain and merging on the other in the richer woodlands of Upper Galilee and the Lebanon. Tristram also records it from Gilead on the other side of the Jordan, but I have not seen any specimens from there. Farther north, however, at Banias, it was collected by Post, and, according to Kotschy, it also occurs in the Antilebanon. Beyond this region it extends through the Jebel Nur into the Cilician Taurus, here, as in the Lebanon, ascending to over 4500 ft. It has also been found in Cyprus from the coast hills to the mountains of the interior. The Arabs distinguish this oak, as has already been stated, as Sindian. Dr. E. Robinson records this name for the Abraham's Oak of Hebron and a similar tree at Seilun (Shilo) in Samaria. Brocchi heard the same name applied to the "*coccifera*" oak of the Lebanon, and Sindyaneh or Sendianeh, N.E. of Kaisariyeh, near the Zimmarin of Major Portal, derives, no doubt, its name from the same vernacular. This oak has been repeatedly figured.

Linnaeus had evidently no first-hand knowledge of the Palestine Oaks*. The only reference to them is in Species Plantarum, ed. ii., 1413, where Judaea is quoted among the habitats of *Quercus coccifera*. This he had from Gronovius (Flor. Or., 1755, p. 119), who, in turn, quotes Rauwolf. The latter (Beschraib. Raiss. Morgenl. 1583), mentions "Ilex minor" from the hills above Tripolis (p. 59) and "Ilices" from east of Rame (p. 460). Belon, who was at Rame about 27 years before Rauwolf, mentions them as "Chênes verds." It was not until 1812 that this oak received critical attention, when Labillardière, who had collected it himself in the Lebanon, described and figured it, identifying it, however, with Desfontaine's *Q. pseudococcifera* from Algeria. Then in 1838 Webb, pointing out its distinctness from the Algerian plant, named it *Q. calliprinos*. Unfortunately he included in this species an oak of which he had collected some imperfect material in the mountains near Tetuan in Morocco. Th. Kotschy, during his travels in the Orient in 1853 and 1855, paid much attention to the oaks and amassed considerable material for study, which was distributed generously and was also to form part of the basis of a monograph of the European and the Oriental oaks. He was evidently much impressed by certain differences, particularly in the structure of the cupule, and without careful collation attached freely new names to the specimens he dispersed. Some of them remained "nomina nuda," although they were quoted by subsequent writers or used for the designation of subordinate forms. Others he connected with very full descriptions and splendid

* Strand, in his Flora Palaestina, usually quoted Linnaeus, Flora Palaestina (Amoen. iv. 1756), enumerates five species of *Quercus*, one of them *Quercus coccifera* of Rauwolf's collection, the others "a Pocockio in Palestina collectas e a D. Millero extricatas." They are evidently the oaks listed by Pococke in his "Description of the East," vol. ii. p. 187, under Tournefortian diagnoses taken from Tournefort's Corollarium. What these correspond to we do not know; but it is very improbable they were based on Palestine specimens, and have evidently nothing to do with the Abraham's Oak. I have not been able to trace Pococke's specimens.

figures in his folio "Die Eichen Mitteleuropas und des Orients," which appeared in parts from 1858-1862. In this work he distinguished four species of the "*coccifera*," which he recognised as a group "Phyllocentron" among the evergreen oaks of his section "*Mesolepidium*." Among these *Q. palaestina* covered the Oak of Hebron, whilst the corresponding oak of the Lebanon is not accounted for. *Q. palaestina* is also mentioned by Kotschy as growing around Hebron, in a paper on the spring flora of South Palestine (in Verh. Zool.-Bol. Ges. Wien, 1861, 16); but in two later papers, "Der Libanon und seine Alpenflora" and "Die Sommerflora des Antilibanon" (ibid. 1864), he mentions *Q. calliprinos* (pp. 451, 455, 748) and *Q. pseudococcifera* (pp. 748, 764), and identifies the latter with the "Sendian" of the natives. Thus Kotschy's account of the "*Coccifera*" remains incomplete and confused; but it seems as if he had meant at some time to extend his concept of *Q. palaestina* so as to include more northern representatives, for he distributed specimens collected on Jebel Nur (Nur Dagh, S.E. Cilicia), in 1859 under the name "*Quercus palaestina*." It was only a few years after Kotschy's travels in Palestine and the Lebanon that Sir J. D. Hooker (1860) visited the same regions. He, too, studied the oaks of the Holy Land in the field as well as in the Herbarium. With much of Kotschy's material before him, he came to the conclusion that there was only one prickly evergreen oak in Palestine, very closely allied to the Kermes oak, but still sufficiently different to require a distinctive name. Although considering the differences as "no more than enough to establish a variety upon," he decided for Labillardière's name *Q. pseudococcifera*, quoting, however, Desfontaine as its author. With this inclusion the area of the Syrian oak was extended automatically to Algeria and the Iberian peninsula, and its distinctiveness practically obliterated. Hooker's paper was read before the Linnean Society in June, 1861, and printed the same year. Three years later (Nov., 1864) followed A. De Candolle's exhaustive monograph of the *Cupuliferae* (Prodrom. vol. xvi. ii.), in which an elaborate attempt was made to classify the numerous forms of the "cocciferae" which had by that time been distinguished in one form or the other. It resulted in the recognition of three species, *Q. coccifera* with the Kermes oak, and *Q. calliprinos* with the Sindian as leading types, and *Q. Fenzlii* based on the oak figured by Kotschy under that name. Eight varieties were recognised under *Q. coccifera*, and ten under *Q. calliprinos*. Desfontaine's *Q. pseudococcifera* was transferred as a var. *pseudococcifera* to *Q. coccifera*, and Webb's specimen of *Q. calliprinos* from Tetuan, to another variety (queried) of *Q. coccifera*, namely, *tomentosa*. *Q. calliprinos* was thus confined to the eastern part of the Mediterranean region ("In orientali regione Maris Mediterranei"), and all the Palestine and Syrian "cocciferae," with the exception of *Q. Fenzlii*, oaks came now under this heading. Kotschy's *Q. palaestina*, as described and figured by him on tab. xix. of his monograph, is quoted as a synonym of var. *arcuata*, a name originally used by Kotschy himself on one of his distribution labels. The Lebanon form of Labillardière, as

already stated, constitutes the nucleus of the species, whilst other forms are described as distinct varieties, namely (γ) *inops* (Lebanon, *Kotschy*), (δ) *consobrina* (Beirut and Lebanon, *Kotschy*), (ζ) *brachybalanos* (Beirut, Carmel, etc., *Kotschy*, *Bove*, *Gaillardot*), and (ι) *pachybalanos* (Carmel, Tabor, *Gaillardot*). To judge by the authentic specimens of those varieties which I have seen, I can see in them nothing but unstable fluctuations or races not worthy of being distinguished at present. For practical and especially economical purposes, at any rate, they may be safely considered as a specific unit, which, under the existing rules of nomenclature, would have to be given the name *Q. calliprinos*. De Candolle's account of *Q. calliprinos* implies a considerable extension of the species beyond Syria and Palestine, through the Taurus and Western Asia Minor to Constantinople, and to Cyprus, Crete, and the island of Zanthe; but from the material I have been able to examine I am inclined to restrict the area in its western and northwestern extension to Cyprus and the Cilician Taurus.

As to *Q. Fenzlii*, some difficulty arises from a certain discrepancy between the original description and figure (Kotschy, Eich. Mittel Europ. Orient, t. 24), and the specimens distributed under that name. Kotschy states that the oak in question was collected "in regione montana Xyftlic" above Tarsus in Cilicia, between 3500 and 4000 ft., and distributed under the Nos. 397 and 398, and that it was distinguished by its small delicate (zart) leaves* and closely compressed phyllaries or cupular scales. The specimen numbered "Kotschy, It. Cil. 398" and localized "in regione montana Zyftlik" at Kew is, in my opinion distinctly *Q. calliprinos*, with an immature acorn whose cupule has phyllaries typical of the species and just beginning to spread out. They are neither as short nor as appressed as shown in the plate. No. 397 of the same set, at Kew, was distributed as *Q. calliprinos*, Webb. It is stated to have been collected "in regione montana prope 'Gullek Boghas'" in the Cilician Taurus at 4000 ft. Both are dated Sept., 1853, and the altitude given for both is 4000 ft. No. 397 is laid out very amply and is undoubtedly *Q. calliprinos* with acorns in a more advanced state. Neither specimen corresponds exactly to Kotschy's figure of *Q. Fenzlii*.

Kotschy, in his book "Reise in den Cilicischen Taurus," enumerates *Q. Fenzlii* on p. 381 as occurring "in collibus cretaceis, bis zu 2000," and on p. 369 he says that it descends in the hill zone—the upper limits of which he places at 2000 ft.—to 1000 ft., whilst *Q. calliprinos* (p. 370) occurs from 2000 ft. upwards. In the "Höhen-tableau" at the end of the book *Q. Fenzlii* and *Q. Calliprinos* are entered under the same number in the 1000-2000 ft. zone in the margin and in the 1000–2000 and 2000–3000 ft. zones in the panorama. Moreover, "Zyftlik" on the shoulders of Hadschin Dagh, east of Gülek gala was not visited in September, as the label says, but on August 24 and 25, and no mention of *Q. Fenzlii* is made in the account of that excursion. Yet *Q. calliprinos* was collected on that occasion and distributed

* In the description the leaves are described as "subcoriacea rigida."

as No. 40 "*Quercus calliprinos*, Webb, var." To unravel the confusion it will be necessary to see the original field labels. At any rate, so much is certain that the Sindian occurs in the Cilician Taurus and that *Q. Fenzlii* is either in part or *in toto* identical with it. I may here add that Kotschy collected in the same region another oak of the "*coccifera*" group which he identified with *Q. rigida* of Willd. (Spec. Pl. iv. 404), and figured on t. 8 of his folio work. It has all the appearance of *Q. calliprinos* except for the usually intensely glaucous underside of the leaves. Willdenow's plant was collected by C. Schwarz in "Caramania," which means no doubt in this case the western continuation of the Cilician Taurus and its foothills. A. de Candolle (l.c. 56) reduced it to a variety (K) of *Q. calliprinos*, and it may indeed represent only an excessive xerophytic condition of the latter. According to Kotschy it is not uncommon near Gülek Boghaz.

Boissier (Flor. Or. iv. 1879; p. 1169), treats our oak under the varieties *calliprinos* (including *Q. Fenzlii*), *pseudococcifera* and *palaestina* of *Q. coccifera*, distinguishing them mainly by the phyllaries whether they are erect and more or less appressed or more or less spreading or squarrosely recurved or finally "eximie retrofractae." Post (Flor. Syria and Palestine, 1896; p. 739), follows Boissier, including, however, the var. *palaestina* under var. *pseudococcifera*.

It seemed worth while to make an attempt to get at an approximate estimate of the age of the famous Sindian of Hebron. For that purpose the following data were available. J. D. Hooker on the authority of Porter who measured it about 1850, gives the girth of the trunk of the tree as 23 ft. A somewhat excentric section of a trunk or more likely a branch of a Sindian oak from Hebron in the Museum at Kew (Vester coll. no. 34), has 37 annual rings. The first 10 rings show over the longest radius an annual average increment of 3 mm., the following 5 of 1·9 mm., and the remaining 22 which are fairly evenly distant of 1·5 mm. Assuming that the trunk of the tree grew after the first 30 years at an average rate of 1·5 mm., the age of the tree may be estimated roughly at 700 years. This would make the date of the starting of the tree the year 1150 or thereabouts, that is the time of the Second Crusade. It is therefore not surprising that we hear nothing of it for a very long time after. Even Belon, a very keen observer and naturalist, who visited Hebron in 1548 does not mention it, although the diameter of the trunk of the tree must have then measured about 4 ft. with a girth of about 13 ft. At that time it would have been, as oaks go, a fair-sized, but by no means very striking tree, particularly if, as we may assume, large trees were then less rare in Palestine than they are now. This, however, is certainly not the full explanation of Belon's omission to mention the tree. It is rather to be sought in the fact that in those days the legend of the Abraham tree attached to a Terebinth (*Pistacia Terebinthus*). This is what Belon (Observ. Plus. Singul. p. 145 *verso*), says—"Le lieu ou Abraham estoit lorsqu'il en veit trois et en adore un. Tres vidit et unum adoravit. nous fut monstré hors le village d'Ebron, dessus le fossé d'un

champ où fût creé Adam et esf merqué d'un Terebinthe, qui a trois arbres sortant d'un tronc." This field was evidently not the same where the present Abraham's oak stands, but farther north where the Jewish tradition has for a long time located the house of Abraham in Mamre. (*See* Ritter, Erdkunde, XVI. iii. 225.) When this terebinth disappeared is not known; it does not seem to have been seen by the numerous travellers who visited Hebron after Belon. But it seems that following on its destruction the tradition of Abraham's house was transferred to the great Sindian oak to the west of the present Hebron.

Some kind of tree cult seems to have been attached to the great trees of Hebron since the earliest times, perhaps as a relic of real tree worship. It has been suggested (Rosenmüller, Bibl. Naturg. 232), that the old Hebrew word for them, Allon or Aelon, signified originally any big tree, just as "oak" is frequently used in the same sense. If that is so, the oak and the terebinth must always have had the monopoly of the claim to that name although we may not be able to decide which of the two was Abraham's tree.

XLII.—ARCEUTHOBIUM OXYCEDRI AND ITS DISTRIBUTION.

W. B. Turrill.

The generic name *Arceuthobium*, M. Bieb., Fl.Taur., 3, p. 629, 1819, is one of the Nomina Conservanda of the Vienna Rules, being antedated by *Razoumowskia*, Hoffm. Hort. Mosq., 1808. This latter name is used by many authors, especially American, instead of *Arceuthobium*. About 18 species are known, all except four being confined to North America. The genus is allied to *Viscum* but is well distinguished by the anthers being distinct from the petals and not adnate to them for the whole or greater part of their length.

An interesting account of the genus entitled "Überblick über die Arten der Gattung *Arceuthobium* (*Razoumowskia*) mit besonderer Berücksichtigung ihrer Biologie und praktischen Bedeutung" by C. von Tubeuf, has recently appeared in Naturw. Zeitsch. Forst- und Landw., 1919, pp. 167-273. This paper deals more especially with the anatomical, physiological and practical questions connected with the genus and is chiefly concerned with American species. The distribution of the extra-American species is not given in detail and two of the recently described ones are not mentioned. A long bibliography is appended.

Of the four species not found in America three can be briefly referred to here. *Arceuthobium minutissimum*, Hook. f., is limited to Kashmir and Nepal, where is occurs on *Pinus excelsa*. It is one of the smallest Phanerogams known, being only 2·5 mm. in length. *A. chinense*, Lecomte in Not. Syst., vol. iii. p. 170 (1915), is parasitic on *Abies* in the province of Yunnan. *A. Dacrydii*, Ridley in Journ. Fed. Malay States Mus., vol. vi. p. 170 (1915), is parasitic on *Dacrydium Beccarii* "near the camp on the Padang." Gunong Tahan, Pahang.

The species with which we are now chiefly concerned is *Arceuthobium Oxycedri*, M.Bieb., l.c., a plant having a wide distribution in the Mediterranean Region and well known as a parasite on various junipers. The following list of localities from which it has been recorded has been made as complete as possible. An exclamation mark indicates that the writer has seen a specimen from the place named.

Spain. Old Castile, Cabreros! Near El Escorial and near S. Lucar de Barrameda (Willk. et Lange, Prod. Fl. Hisp. vol. i. p. 24).

France. Basses Alpes, Sisteron! Several localities between Sisteron and Montpezat (Rouy et Fouc., Fl. de Fr., vol. xii. p. 284). Hautes Alpes, Ribiers! Var, several localities (Alb. et Jahan, Cat. Pl. Var, p. 422). Bouches-du-Rhône, Mimet, Marseille (Rouy et Fouc., l.c.).

Istria. Distr. Capodistria, between Brezzi and Puzzole! Carcauzze! Near Corte d'Isola, on the eastern slopes of the Vanderinga Valley and near Borutto (Pospichal, Fl. des Oesterr. Küstenl., vol. i. p. 421).

Croatia. Zengg (Beck, Illyr. Länder, Engl. u. Drude, Veg. der Erde, vol. iv. p. 73).

Dalmatia. Near Fiume! Between Buccariza and Porto-Ree!

Epirus. Near Syraku, at the foot of Mt. Peristeri (Halácsy, Conspec. Fl. Graec. vol. i. p. 696).

Albania. Distr. Hoti, Bukovik! Distr. Janina, between Paleochori and Syrareon! Mt. Tomor!

Greece. Mt. Oeta! Mt. Parnassus! Thessaly, near Chaliki, Krania, Klinovo, Sermeniko in Pindus (Halácsy l.c.).

Macedonia. South Macedonia, without precise locality! Xerolivadon (Vandas, Reliq. Formanek.. p. 251).

Serbia. Kopaonik, Stol, and Čačaker (Beck, l.c. p. 93).

Bulgaria. Above Stanimaka (Velenovsky, Fl. Bulg. Suppl. i. p. 140).

Azores. Mt. Pico!

Algeria. Prov. Oran, Vaida! Near Batna! Gharrouban! Dhaya! Lella-Khadidja, Teniet, Aures, etc. (Batt. et Trab. Fl. de l'Alg., p. 786).

Asia Minor. Amasia, Ak Dagh! Taurus, Cilician Gates! Sivas.

Syria. Lebanon, Amanus and Akher Dagh (Post, Flora of Syria, Palestine and Sinai, p. 712).

Armenia. Riltzagadsch! Alliper Dagh!

Kurdistan. Oroomah!

Caucasus. Tiflis!

Crimea. Sudak, Mt. Pertsch!

N.E. Persia. Near Radkan (Boiss. Fl. Or. vol. iv. p. 1068)

Punjab-Himalaya. Lahul!

Tropical Africa. Aberdare Mountains!

The plant has also been said to occur in Portugal and Corsica, but no specimens have been seen from these countries by the writer, nor have trustworthy records been traced. The *Arceuthobium Oxycedri* of Hooker, Fl. Bor. Amer., vol. i. p. 278, tab.

xcix., appears to be chiefly *A. campylopodum*, Engelm., though the plate also contains figures of the European *A. Oxycedri*, M. Bieb. A good figure with dissections of the European *A. Oxycedri* is to be found in Reichb., Ic. Fl. Germ., vol. xxiv. tab. 141.

The Tropical African locality given above is of exceptional interest since the plant has not previously been known to occur outside the Azores, the Mediterranean Region, and Western Asia. The specimen was collected by Mr. W. J. Dowson on the north-western slopes of the Aberdare Mountains in British East Africa, at 6500 ft. altitude, growing parasitically on *Juniperus procera*, Hochst. This juniper has been fully dealt with in the Flora of Tropical Africa, vol. vi. Sect. 2, p. 336. It is the only species of the genus occurring in Tropical Africa and is widely distributed in Eritrea, Abyssinia, Somaliland, Uganda, British East Africa and Nyasaland. The tree is a most valuable timber tree in East Africa, as indicated by Hutchins, Rep. Forests on Kenia in Col. Rep. Misc. No. 41 (1907), p. 15. Since *Arceuthobium* is a parasite comparable in its effects on the host to the mistletoe and other Loranthaceous parasites its presence in East Africa may be of some economic importance.

In connection with the record of *Arceuthobium* on the Aberdare Mountains, a paper on "*Fomes juniperinus* and its occurrence in British East Africa," by Miss E. M. Wakefield in the *Kew Bulletin*, 1915, p. 102, may be mentioned. *Fomes juniperinus* is there recorded for the first time on *Juniperus procera* in East Africa. Its previously known distribution was United States and Russia. The geographical distribution of fungi is known often to be erratic, but the partial coincidence in distribution between the two juniper parasites *Arceuthobium* and *Fomes juniperinus* is interesting.

It is well known that *Arceuthobium* has explosive or sling fruits. A paper by Dr. T. MacDougal in Minnesota Botanical Studies, vol. ii. p. 169, 1899, deals in detail with the explosive mechanism of an American species. The American representatives of the genus like the Old World ones have very local and discontinuous distribution, and in this connection the methods of seed dispersal have to be carefully considered. In MacDougal's paper, quoted above, it is pointed out that the only localities which offer suitable conditions for the germination of the seeds are the tips of branches or the shoots of young trees underneath, and no animals are to be found in the habitat of the parasite which would in ordinary usage carry the seeds to these locations. Studies in Northern Arizona showed that the distribution has a direct connection with the vertical movements of the air. Rising air expands and cools, and in consequence the dew point is lowered or the relative humidity increased. This gives a condition most favourable for germination of the parasite, which is found in abundance along the margins of hills and the rims of cañons.

E. Heinricher, in Centralbl. f. Bakteriobiologie, vol. xlii. p. 705, 1915, states that the seeds of *Arceuthobium* will only germinate under the following conditions: presence of a living

or organic substratum, light, and a chemical stimulus (probably that provided by cellulose). Other authors have urged the importance of moisture or even liquid water for germination.

The explosion which accompanies the destruction of the fruit will shoot the seed some 30 to 40 ft., but some other cause must account for the wide and discontinuous distribution of *Arceuthobium Oxycedri*. There is no evidence that the fruits are eaten by birds, but the possibility of an exploding fruit hitting a bird must be considered. The likelihood of this happening is decidedly increased by the fact that the jerk of a bird alighting on a slender branch would cause all the mature fruits near to explode and to scatter their seeds in all directions. Many species of birds are widely spread in the Mediterranean Region, and the long migrations of some species would enable them to transport seeds stuck to them for great distances. Thus, a colony of the Yellow Wagtail (*Motacilla campestris*), is found from South-East Russia to Turkestan in summer, and winters in South Africa. The chances seem in favour of such a bird now and again getting a sticky seed, such as one of *Arceuthobium*, stuck to its feathers and getting rid of it either en route or at its destination. That *Arceuthobium* is not more widely distributed by this means is probably due to its dependence on a narrow range of host-plants and on certain conditions for germination, but it is difficult to see how its spread to Tropical Africa can be otherwise explained. Warming, "Botany of the Faeroes," pp. 676–678, gives very strong evidence against birds acting as regular fruit and seed dispersal agents over long distances, but it is to be noted that the observations quoted were all made in the colder North Sea area, and in any case do not eliminate the possibility of occasional transport by birds from one country to another. As regards the discontinuous distribution of the genus *Arceuthobium* in the North Temperate Zone a classification of it with the "Tertiary Relicts" which are so conspicuous a feature in any analysis of European vegetation is suggestive. However, from what has been said above, it seems more reasonable to think of *Arceuthobium Oxycedri* with its distinctive method of seed-dispersal apart from the majority of such Tertiary relicts as *Forsythia*, *Ramondia*, etc., and to conclude that it owes its present discontinuous distribution, in part, at least, to causes still working rather than to changing climatic and topographic conditions having broken up a once continuous distributional area. It is, of course, extremely probable that the wide gap between the Tropical African and Mediterranean or Asiatic stations will be more or less bridged by the discovery of *Arceuthobium* in intermediate localities, perhaps on the junipers of Eritrea, Somaliland, Abyssinia or South Persia.

That *Arceuthobium Oxycedri* is not alone among Mediterranean plants found on Tropical African mountains is evident from a study of their flora. Thus, Engler, in a paper in the Annals of Botany, vol. xviii. p. 523 (1904), records the following species or genera with closely allied species which occur both in the Mediterranean Region and in Tropical Africa: *Luzula*, *Anthoxanthum*, *Koeleria cristata*, *Arabis*, *Subularia*, *Stenophragma Thalia-*

num, *Cerastium*, *Sanicula europaea*, *Sambucus*, *Veronica*, and *Populus euphratica*. To these might be added *Erica arborea*.

Guppy, who was the first to record *Arceuthobium Oxycedri* from the Azores ("Plants, Seeds and Currents in the West Indies and Azores," pp. 426–427) comes to the following conclusion: "It is thus likely that birds actively disseminate the species, carrying the seeds firmly adhering to their plumage. In this respect *Arceuthobium* resembles *Luzula* . . . and it is noteworthy that the two genera have a similar distribution."

The genus *Arceuthobium* has not been definitely recorded in the fossil state, but *Loranthacites succineus*, Conw., *Patzea Johniana*, Conw., and *P. Mengeana*, Conw., described and figured by Goeppert, Menge und Conwentz, Flora des Bernsteins, pp. 135–138, tab. xiii. ff. 6–20, could well represent the ancestors or relatives of our genus, though, since the structure of the fruit is unknown, nothing can be said definitely on this subject.

The following species of *Juniperus* have now been recorded as host-plants of *Arceuthobium Oxycedri*: *J. Oxycedrus*, *communis*, *rufescens*, *drupacea*, *Sabina*, *brevifolium* (Azores) and *procera* (Trop. Afr.).

XLIII.—THE ARBORETUM AND PINETUM AT BICTON.

W. J. Bean.

Sixty to eighty years ago no garden in the south of England was more famous than that at Bicton. It owed its fame then chiefly to the excellent cultivation carried on there of orchids, stove and greenhouse plants, pine-apples and other indoor fruits, as well as to its flower gardening in the open air. At the present time the pilgrim to Bicton is attracted thither chiefly by its collection of conifers.

But the garden proper is full of charm. Largely formal in character, it has that serene dignity which comes with age to all such gardens designed at the outset on broad, adequate lines. There are no irritating trivialities here, unless one takes exception to a row of bay trees severely trimmed to low standards, each a naked stem surmounted by a bun-shaped top of branches. The garden is situated on a slope, and the lower section is an arrangement of water at different levels, canalised and in rectangular pools, with smooth perfect lawns between, the whole diversified by ancient Irish yews and some beautiful old leaden statuary. The garden is enclosed on each side of the slope by high walls clothed with vegetation, outside which lofty trees make a perfect frame for the whole.

The Bicton of early Victorian days was the home of Lord Rolle, an ardent patron of horticulture, to whom tree-lovers of our own time are indebted for the foundation of the magnificent Pinetum about 1841. Unhappily he died, comparatively young, in 1842, probably before the planting was completed, but the work he initiated was vigorously carried on by Lady Rolle, his

widow, who lived until 1885. At her death the property came to the late Hon. Mark Rolle, from whom it passed to Lord Clinton, the present owner.

In old accounts of Bicton, the collection of conifers and hardy trees and shrubs was said to occupy between thirty and forty acres. As some new ground has in late years been planted with conifers by Lord Clinton, the area is no doubt greater to-day. The arrangement is unusual and interesting. The collection of broad-leaved trees and shrubs occupies a comparatively narrow grassy belt surrounding one section of the park. This belt is enclosed on each side by an iron fence and is traversed by a gravel path, between which and the fence the trees and shrubs are planted on either side. The arrangement is one probably unique in a private garden in this country, and is particularly interesting to one with a Kew training, for it is purely botanical and the plants come in sequence in their genera and natural orders. Near the house a commencement is made with what, in 1840, were considered the "early" orders, such as *Magnoliaceae*, *Ternstroemiaceae*, etc.; passing on in succession through the *Leguminosae*, *Rosaceae*, etc., we come to the "later" ones, including such trees as elms, birches, planes, oaks and poplars, until finally, after traversing a roughly circular route for about $1\frac{1}{2}$ miles the Pinetum is reached. The *Coniferae* are not confined to a comparatively narrow belt, like the broad-leaved trees and shrubs, but occupy a widespread undulating and picturesque site, between the hills and hollows of which are pleasant winding walks. Leaving the Pinetum one reaches the formal garden previously alluded to, and the precincts of the house again.

The Arboretum, as distinct from the Pinetum, has not been maintained in late years, and many species originally planted there have no doubt disappeared. Nor is the soil apparently so good as that occupied by the conifers. So that whilst there are numbers of finely developed broad-leaved trees and shrubs well worth more study than I was able to give them in one visit, they have not the attraction that the magnificent firs, pines and spruces possess. In the Pinetum one walks amongst an assembly of trees 60 to over 100 ft. high, probably unrivalled in England in their combination of size and variety.

Pines.—Of the genus *Pinus* there is a particularly fine collection, although a considerable number of the older trees show signs of failing. Many of the names under which they are grown are no longer in vogue.

In the south-western maritime counties, *Pinus radiata* (*P. insignis*) is very often remarkable for its fine development, but there cannot be many so fine as one at Bicton. It is probably the same as one measured by Mr. Elwes in 1902, which was then 75 ft. high and about 15 ft. in girth; I made its finely rugged trunk to be now 18 ft. in girth. Not far from this tree is one of *P. contorta* (here grown under its synonym *P. Banksiana*), a very healthy, shapely tree with a trunk 7 ft. 6 in. in girth. There are but few examples of the true pitch pine of the S.E. United States (*P. australis*) in this country, and the one in this

collection must be amongst the largest; it is an old, rugged specimen with the characteristic long leaves in conspicuous tufts at the ends of the branches, its trunk 4 ft. 4 in. in circumference. Of the sugar pine (*P. Lambertiana*), whose wonderful cones are sometimes 21 in. long, there is a fine tree 80 to 90 ft. high, its trunk girthing 9 ft. 4 in.; this tree occasionally bears cones. The Jack pine (*P. Banksiana*), although introduced nearly 120 years ago is not common in England in any great size; here is one over 30 ft. high, bearing many of its curious small cones tapered and curved at the end and retaining them on branches several years old. Of a series of forms of the white pine (*P. Strobus*), one of the most noteworthy is a tree of the var. *nivea* of slender, pyramidal form, its grey smooth trunk girthing 5 ft. The western representative of the white pine in North America is *P. monticola*, of which there is here a fine tree 80 to 90 ft. high with a trunk 6 to 7 ft. round. A specimen of *P. ponderosa*, although scarcely so impressive as the famous tree at Bayfordbury, in Hertfordshire, must be one of the finest in this country; I estimated its height to be about 90 ft., and its trunk measures 9 ft. 5 in. in circumference. One of the least imposing of pines is the Jersey, or scrub, pine (*P. virginiana* or *P. inops*), from the Eastern United States, and it is rarely planted now; at Bicton a tree of spreading habit and horizontal branching is 4 ft. 8 in. in girth of trunk.

Of the Mexican pines the most notable in this collection, perhaps, is *P. patula*. It is only in the south-western counties of England and in places with a similar climate that this species can be seen in really good condition, but there its long, slender, pendulous grey needles make it one of the most distinct of all pines; at Bicton there is a very good example over 50 ft. high dividing near the ground into two great limbs, beneath which the trunk measures 11 ft. 9 in. in girth. From Mexico also comes *P. Ayacahuite*, represented at Bicton by probably the finest tree in England; it is apparently over 70 ft. high, canopied with rich green foliage, its trunk girthing 10 ft. 2 in. A tree grown as *P. Don Pedri* is also *P. Ayacahuite*. A third Mexican pine is *P. Teocote*, bearing its long, stiff, spreading leaves in threes, a tree at Bicton is over 60 ft. high, its trunk 7 ft. in girth; this tree is extremely rare in cultivation. A commoner one, also Mexican, is *P. Hartwegii*, sometimes regarded as a short-leaved variety of *P. Montezumae*. Of two trees at Bicton one approaches 80 ft. in height and is about 6 ft. round the trunk. This is probably the hardiest of the Montezumae group of pines, and there is a good tree in Windsor Forest. Under the name of *P. Devoniana* there is a tree of the true *P. Montezumae* 25 ft. or so high.

Among European pines none is more interesting than a specimen of the Macedonian pine, *P. Peuke*, which is undoubtedly one of the best in Britain; it is 50 ft., or perhaps more, high, its trunk 5 ft. 1 in. in girth. Although closely allied of *P. excelsa* this pine is very distinct in its slender pyramidal habit and closer growth. *P. Laricio* is represented by a fine series of forms of that variable species, many of the trees being of very large size. Of

the maritime pine (*P. Pinaster*), I noted two trees of particular interest, one named var. *Hamiltonii* was 8 ft. 9 in., the other, var. *dictrilis*, 9 ft. 11 in. in girth of trunk. A pine called *P. altissima* belongs probably to *P. Pinaster* also.

Silver Firs.—No trees enjoy the soft, moist climate of the south-western counties more than the silver firs, and on the whole they are better developed at Bicton than the pines. For this country many of them are giants, and more than any other conifers they help to produce the deep shady masses of vegetation whose luxuriance is so impressive at Bicton. Of the American species the two finest are *Abies Lowiana* and *A. grandis;* a tree of the former has a trunk 10 ft. in girth, and I judged it to be between 80 and 90 ft. high; whilst of the latter, one is 10 ft. 6 in. in girth and perhaps 10 ft. higher than the *A. Lowiana*. One of the rarest of silver firs to be seen in fine condition in the British Isles is *A. amabilis* (it grows naturally to upwards of 200 ft.); at Bicton it is only 25 ft. high, but very healthy. *A. bracteata*, so remarkable for its long needle-pointed leaves, its large brown buds and formidably armed bracts, is represented by two trees, but neither is very healthy, although the larger one is perhaps 45 ft. high.

Of the Old World firs the finest at Bicton is a superb example of *A. cephalonica*, its trunk 16 ft. in girth: in the bulk of timber it contains this tree is probably unequalled amongst its kind in this country. The allied *A. Pinsapo*, most distinct of European firs and confined in a wild state to a comparatively small mountainous region in the south of Spain, is in good health, one tree being 14 ft. 6 in. in girth of trunk, its head of branches making a fine pyramid 55 ft. high. There are finer trees of *A. Pinsapo* in the country, but few that excel one of *A. Nordmanniana* at Bicton; it is in perfect health and probably 80 ft. high, its trunk 7 ft. 4 in. in circumference.

The interesting *A. numidica*, rare in cultivation and confined in a wild state to a small area on Mount Babor in Algeria, is represented here by a tree whose dimensions exceed those of any other tree I have seen recorded in this country: I estimated it at some 70 ft. in height and its trunk measured nearly 7 ft. round. Equally as rare as the Mt. Babor fir in cultivation is *A. cilicica;* here at Bicton is one over 50 ft. high and 4 ft. in girth. To us in the dry, hot Thames Valley, where the common silver fir (*A. pectinata*), can scarcely be kept alive, much more grown to any size, no tree at Bicton is more impressive. I measured one as carefully as I could, and made it about 125 ft. high.

Of Japanese firs, *A. brachyphylla* is 4 ft. 10 in. in girth or trunk and some 60 ft. high, its health superb: even finer is a magnificent *A. firma*, 65 ft. high and girthing 5 ft. 9 in.

The Himalayan *A. Pindrow* is about 40 ft. high.

Spruces.—Amongst the spruces (*Picea*), none is finer than two specimens of the Himalayan *Picea Morinda*—also known as *P. Smithiana*—so distinct among its kind for the long, weeping branchlets; the larger one in the Pinetum girths 8 ft. 1 in. and

is perhaps 80 ft. high, the other grows in the garden proper and is not so large, but is clothed with leafy branches to the base and forms a perfect pyramid. Perfect, too, in shape and in health is a splendid tree of *P. orientalis*, 6 ft. 1 in. in girth and probably 80 ft. high; this beautiful spruce is very hardy and one of the most thriving in the London district, and the shortness of its leaves (they are only $\frac{1}{4}$ to $\frac{1}{3}$ in. long), gives its branchlets a very characteristic and graceful appearance. Although introduced nearly sixty years ago, there do not seem to be any large trees of *P. polita* in this country, notwithstanding the fact that it is hardy, succeeds well in a small state and, in Japan, gets to be 70 to 80 ft. high; at Bicton there is a healthy tree 35 ft. high and 3 ft. in girth of stem.

Of the flat-leaved spruces the largest, of course, is *P. sitchensis*, one tree being 13 ft. 6 in. in girth of trunk and, therefore, one of the bulkiest in this country, but like so many other Sitka spruces in cultivation, the large quantities of grey, lifeless twigs towards the base of the tree spoil its appearance as a garden feature. The Japanese flat-leaved spruce known as *P. ajanensis* and *P. hondoensis* (both now regarded by Mr. E. H. Wilson as synonymous with *P. jezoensis*), is represented by a healthy tree 50 ft. or so high. There are smaller trees of the Serbian *P. Omorica* and the Californian *P. Breweriana*.

Araucaria imbricata.—An avenue at Bicton, some 500 yards in length, is the most famous and impressive representation of this Chilean tree in the British Isles. It is formed by fifty trees, twenty-five on each side, and they stand 54 ft. apart in the rows. According to Veitch's "Manual of Coniferae" (Ed. i. p. 195), the avenue was planted in 1843-4 under the direction of Mr. James Veitch. The trees now average about 60 to 70 ft. in height and 7 to 8 ft. in the circumference of their boles. Most of them have lost their lower branches, but this does not detract from the general effect, and reveals the curious wrinkled, swollen base of the trunks.

Amongst junipers the most notable one I saw at Bicton was *Juniperus recurva*, a Himalayan species; this was about 40 ft. high, branching into several stems near the ground; being in fine health it shows the striking pendulous character of the branchlets very well; a smaller one is about 35 ft. high, and both bear fruit freely. Of about the same size is a tree of *J. flaccida*, but not so healthy. There are good plants of the dwarf *J. squamata* and *J. procumbens*; and a plant of the very rare *J. Wallichiana*, only 4 ft. high, but bearing fruit.

There is a very good collection of cypresses, and it has recently been increased considerably by Lord Clinton, who has added many varieties of *Cupressus Lawsoniana*, amongst which is the finest specimen I have seen of the curious variety *Wisselii*—a slender tapering tree about 30 ft. high. Of the more tender cypresses there are *C. torulosa*, a tall columnar tree with a trunk 4 ft. 7 in. in girth: several forms of *C. lusitanica*, one over 50 ft. high: *C. funebris*, perhaps 35 ft. high: and a small *C. cashmeriana*. On the garden lawn, there are fine specimens of *C. thyoides* and *C. sempervirens*.

On the lower part of the garden are two of the finest trees of *Libocedrus decurrens* in the country, making a pair of stately columns; one of them is over 8 ft. in girth of trunk and about 65 ft. high; Elwes mentions another one near the house which is even finer. In the Pinetum is a magnificent *Thuya plicata* (*T. gigantea*), its trunk clothed with rich brown bark and 13 ft. in girth; I estimated its height as between 90 and 100 ft. Even taller are some splendid Douglas firs in groups, one that I measured girthing 11 ft. A redwood (*Sequoia sempervirens*), has a similar girth. It is very unusual to find any but quite young trees of *Cunninghamia sinensis* looking really healthy, and a tree at Bicton, although 60 ft. high and 5 ft. round its bole (and, therefore, one of the biggest in England), is no exception.

To the lover of rare and interesting plants there is no tree at Bicton which will make a greater appeal than *Phyllocladus asplenifolia*. This curious conifer belongs to a genus allied to the yews, but distinguished by curious leaf-like organs of rhomboidal shape termed "phyllodes." Sir Joseph Hooker remarks of the species of *Phyllocladus* that they are remarkable for having "leaves of two forms, some minute and scale-like, others linear, seen only in young plants, but which in older are united into flat fan-shaped organs resembling simple leaves, which bear the inflorescence at their edges." (New Zealand Flora, p. 259.) The tree at Bicton is 32 ft. high, of slender pyramidal form, and in luxuriant foliage and perfect health. I do not know of any other tree in our islands equal to this; it would, itself alone, give distinction to any garden.

Of *Fitzroya patagonica*, from Chile, a not uncommon tree in the south-western counties, a very healthy and symmetrical specimen is 20 ft. high and 10 ft. wide at the base. Another Chilean conifer, *Prumnopitys elegans*, is represented by a tree which must be one of the finest in this country; I estimated it at 36 ft. in height, and the spread of its lower branches is 20 ft.; it was bearing its small male flowers in great numbers.

The Himalayan hemlock (*Tsuga Brunoniana*), is rarely seen in good condition in any but the warmer counties or specially favoured spots: a perfectly healthy tree here is 15 ft. high; and another is in the form of a rounded bush 25 ft. through.

A conifer of which Bicton has reason to be proud is the larger of two Deodars growing on the garden lawn; it is about 80 ft. high and its trunk 13½ ft. in circumference. In regard to the cubic contents of its timber, this is probably the finest tree in the British Isles. In habit it strongly resembles the Cedar of Lebanon, of which also there is a notable tree with a huge trunk 22 ft. 6 in. in girth.

The Arboretum.—The Pinetum at Bicton is so extensive and full of interest, and took up so much of my time, that an inspection of the non-coniferous trees and shrubs was necessarily rather hurried. A full day might profitably be spent with them.

A good deal of interest has in recent years been taken in the South American 'beeches' (*Nothofagus*). The oldest of them in this country is the evergreen *Nothofagus betuloides*, and there are

several fine examples in the south-west, but I have seen none to equal the one here. Its head of branches is over 50 ft. high and about 40 ft. in diameter, and its trunk, which branches low down, measures 9 ft. in girth 18 in. from the ground.

Near the greenhouses is a Black Italian poplar (*Populus serotina*), whose immense trunk is 18 ft. 2 in. in circumference; it is one of the largest in the kingdom. There are also some fine grey poplars (*P. canescens*), in the Arboretum.

At the lower part of the garden there is a remarkable lime tree with very slender, pendulous branches, some of which are 20 ft. in length, yet no thicker at any part than a man's finger. This character is most developed on the lower part of the tree, which is a lofty one with a trunk 14 ft. in girth.

In the collection of oaks founded 70 to 80 years ago there are now many notable specimens. Among evergreen species the rare *Quercus acuta* from Japan is a bush 12 ft. high and 18 ft. in diameter; it was introduced by Maries in 1878. Its ally, *Q. glabra*, also rare and Japanese, is 20 ft. high, 20 ft. through, with the main stem 2 ft. 2 in. in girth; both this and the *Q. acuta* are probably as large as any in the country. Of several forms of Holm oak (*Q. Ilex*), the most striking is the big-leaved variety *latifolia*, with leaves $5\frac{1}{2}$ in. long and $2\frac{1}{2}$ in wide; the tree itself has a trunk 10 ft. 10 in. in girth. Another variety here called "Q. crassifolia," but probably *Q. Ilex* var. *Genabii*, has rounded leaves not so long as those of var. *latifolia*, but 3 in. wide. A fine Lucombe oak is 15 ft. in girth of trunk. Of the common oak there are many fine trees at Bicton; the noblest of them, which unfortunately collapsed some months ago, had a trunk 25 ft. 2 in. in girth at 3 ft. from the ground. There is also a fine specimen of the pendulous *Q. pedunculata*.

A snowdrop tree (*Halesia carolina*), of notable size has a trunk girthing 5 ft. Some interest has recently been taken in the living specimens of the tea plant (*Camellia Thea*), in this country (*see* "Gardeners' Chronicle," Aug. 18, 1917); there are at least three at Bicton which have long been grown in the open air, the largest a bush 8 ft. high and 12 ft. through. A camphor tree (*Cinnamomum Camphora*), is 35 ft. high.

Colletia cruciata is a remarkable shrub from Uruguay which assumes two distinct forms; one is armed—in fact, almost consists of—flat triangular spines $1\frac{1}{2}$ in. wide at the base; the other form has rather bodkin-shaped, comparatively slender spines $\frac{1}{2}$ to $1\frac{1}{2}$ in. long. The large-spined form was first raised at Bicton, and by Lindley was named *C. bictoniensis*. A bush there is now 25 ft. in diameter.

It would be possible to go on naming many other interesting trees and shrubs, such, for instance, as: *Acacia dealbata*, 30 ft. high and in perfect health; *Vaccinium oratum*, 10 ft. high and 18 ft. in diameter, much the largest I have seen; the Himalayan *Euonymus pendulus*, 8 ft. high and in flower; *Illicium anisatum*, with fragrant leaves and wood and pale yellow flowers; the small leaved form of *Kalmia latifolia*, known as var. *myrtifolia*, 8 ft. high; *Pittosporum tenuifolium*, 30 ft. high; *Magnolia tripetala*,

an old but no longer common species, 28 ft. high and 5 ft. in girth of trunk; and a fine healthy tree of the newer Japanese *M. hypoleuca* over 30 ft. high.

There is a good collection of hardy bamboos on the lower, damper part of the garden, and it was interesting to see *Phyllostachys aurea* flowering, although not gratifying, since it portends the flowering and consequent death of the species throughout the country.

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XLIV.—BOCCONIA AND MACLEAYA.

J. Hutchinson.

The genus *Bocconia* (*Papaveraceae*) was founded by Linnaeus* in 1737, the type species being *B. frutescens*† from the West Indies and Central America. Since then several species have been described, of which seven stand as being authentic in the Index Kewensis. These are natives of Central and South America, with the exception of two species, *B. cordata*, Willd., and *B. microcarpa*, Maxim., from North-Eastern Asia. Whilst the close affinity of the floras of North America and North-Eastern Asia has been well established, there is little, if any, connection between those of North-East Asia and South America, and the association of Papaveraceous plants of peculiar type from these two regions in the same genus, were it tenable, would be of considerable phytogeographical interest. That two very distinct genera are involved, however, is shown below.

In the Appendix (p. 218) to the Narrative of Denham and Clapperton (1826), Robert Brown makes the following observation: "Respecting *Bocconia cordata*, though it is so closely allied to *Bocconia* as to afford an excellent argument in favour of the hypothesis in question, it is still sufficiently different, especially in its polyspermous ovarium, to constitute a distinct genus, to which I have given the name (*Macleaya cordata*) of my much valued friend, Alexander Macleay, Esq., Secretary of the Colony of New South Wales, whose merits as a general naturalist, a profound entomologist, and a practical botanist are well known." In spite of this trenchant remark, however, Bentham and Hooker considered *Macleaya* to be congeneric with *Bocconia*, although Endlicher‡ had in 1839 supported the views of Robert Brown, as did also subsequently Prantl§ and, lastly, Fedde.‖

I give below the differences observable between these two genera, and a revision of the species of *Bocconia* so far as we know them at present.

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* Linnaeus, Gen. ed. i. 32 (1837).
† Linnaeus, Sp. Pl. 505 (1753).
‡ Endlicher, Genera Plantarum, ii. 855 (1839).
§ Prantl in Engl. et Prantl. Natürlich. Pflanzenf. iii. 2, 140 (1889).
‖ Fedde, Monogr. Papaveraceae, 216 (1909).

Bocconia, *Linn.*

Stems perennial. Leaves pinnately nerved or lobed; ovary long-stipitate. with a single basifixed ovule; valves of the fruit fleshy, opening from below upwards; seed large and nearly filling the loculus, surrounded at the base by a large cupular wrinkled aril — *See* text figures A-E.

Macleaya, *R. Br.*

Stems annual. Leaves palmately nerved and lobed; ovary subsessile, with one basal or few parietal ovules; valves of the fruit membranous, opening from the top downwards; seeds small, with a lateral crested aril— *See* text figures F-I.

FIG. A-E —*Bocconia arborea*, Wats.:—A, upper leaf; B, pistil; C, opening fruit; D, seed; E, persistent placentas of fruit; F-H, *Macleaya cordata*. R. Br.; J-I, *Macleaya microcarpa*, Maxim.; leaves $\frac{1}{2}$ nat. size, remainder enlarged.

Clavis specierum Bocconiae.

Folia petiolata:—

Folia plerumque plus minusve pinnatilobata:—

Folia (praesertim superiora) basi acute cuneata, lobis lateralibus angustis acute acuminatis; folia inferiora profunde pinnatipartita:—

Stamina circiter 12; sepala 1 cm. longa; stigmata crassa, 4·5 mm. longa, dense tomentosa ... 1. *B. arborea.*

Stamina circiter 20; sepala circiter 0·8 cm. longa; stigmata angusta, puberula ... ... 2. *B. Pearcei.*

Folia basi plerumque rotundata, lobis lateralibus satis latis apice rotundatis vel breviter acutis (vix acuminatis); folia inferiora haud ultra medium lobata:—
Foliorum inferiorum lobi laterales plerumque 5–10, serrato-dentati:—
Bracteae glabrae vel glabrescentes; stamina 16 ... 3. *B. frutescens.*
Bracteae dense tomentosae; stamina 10 ... ... 4. *B. pubibractea.*
Foliorum inferiorum lobi laterales 2–5, obscure et remote denticulati ... ... 5. *B. latisepala.*
Folia haud lobata, serrata vel crenata:—
Folia infra puberula; nervi laterales numerosissimi:—
Folia obtuse serrato-crenata; species austro-americana ... 6. *B. integrifolia.*
Folia profunde repando-dentata; species centrali-americana ... 7. *B. gracilis.*
Folia infra glauca, glabra ... ... 8. *B. glaucifolia.*
Folia sessilia, crebre et obtuse serrulata; bracteae glabrae; species guatemalensis 9. *B. vulcanica.*

1. **Bocconia arborea,** *Wats.* in Proc. Amer. Acad. xxv. 141 (1890); Fedde Monogr. Papaveraceae, 219 (1909).

Arbor usque ad 8 m. alta; rami annotini fere glabri, circiter 8 mm. crassi, hornotini foliati, lanato-tomentosi. *Folia* inferiora petiolata, profunde pinnatipartita, usque ad 45 cm. longa et 30 cm. lata, supra glabra, crebre reticulata, infra albescentia, papilloso-puberula, lobis lateralibus lineari-lanceolatis usque ad 15 cm. longis et 2·5 cm. latis serratis; folia superiora circiter 15 cm. longa, basi acute cuneata, supra primum lanato-pubescentia, infra praesertim in costa lanata et albido-papillosa, lobis lateralibus ascendentibus acute acuminatis obscure denticulatis vel fere integris; petioli lanato-tomentosi. *Panicula* circiter 20 cm. longa et 12 cm. lata; bracteae oblongo-lineares, subobtuse acuminatae, apice puberulae, usque ad 1 cm. longae; pedicelli fere 1 cm. longi, glabri. *Sepala* oblongo-elliptica, acuminata, 1–1·2 cm. longa, 3–3·5 mm. lata, glabra, marginibus subhyalinis. *Stamina* circiter 12; filamenta filiformia, 2 mm. longa; antherae 7 mm. longae, acutae. *Ovarium* 5 mm. stipitatum, 2 mm. longum; stylus 4 mm. longus, ramis divergentibus 4·5 mm. longis ad basin stigmatoso-puberulis. *Fructus* 7 mm. stipitatus, nutans, ellipsoideus, carnosus, 1 cm. longus, stylo persistente elongato coronatus. *Semina* (immatura tantum visa) basi arillo crustaceo rugoso.

Central America. Mexico: Jalisco State: rich canyons of the mountains near Lake Chapala, young fr. Dec. 1889. *C. G. Pringle* 2445 (type). Morelos State: lava fields above Cuernavaca,

2200 m., fl. Sept. 1900, *C. G. Pringle* 9145: fr. Nov., *C. G. Pringle* 9682. Guatemala: Cunen, Quiche Depart., 2000 m., fls. Apr. 1892, *Heyde & Lux in Donnell Smith Herb.* 2898. Costa Rica: San Jose, 1100 m., *J. D. Smith* 4739; Rio Tirriti, 1100 m., young fr. Mar. 1896, *J. D. Smith* 6430; Mar. 1894, *J. D. Smith* 4739.

2. **Bocconia Pearcei,** *Hutchinson*, sp. nov.

B. frutescens, forma *glaucescens*, Fedde, Monogr. Papaveraceae, 218, partim.

Arbor tenuis, ramosa, usque ad 6 cm. alta, omnibus partibus glaucis succo cinnabarino scatens (*Spruce*); ramuli ultimi glabri, circiter 8 mm. crassi. *Folia* inferiora usque ad 45 cm. longa et 24 cm. lata, profunde pinnatilobata, lobis oblongis subacutis serrato-dentatis, supra glabra, infra albida, crispato-puberula; costa infra sulcata, circiter 6 mm. lata; folia superiora basi longe cuneata, paucilobata, breviter petiolata, circiter 25 cm. longa et 14 cm. lata. *Panicula* magna, usque ad 40 cm. longa, ramosissima; bracteae oblongo-lanceolatae, subacute acuminatae, pedicellis circiter dimidio breviores, marginibus puberulis; pedicelli graciles, 0·8–1 cm. longi, glabri. *Sepala* elliptica, brevissime abrupte acuminata, 1–1·2 cm. longa, glabra. *Stamina* circiter 20; filamenta filiformia, 2 mm. longa; antherae 7 mm. longae. *Ovarium* 5 mm. stipitatum, 2·5 mm. longum; stylus 4 mm. longus, stigmatibus acutis circiter 3 mm. longis breviter puberulis. *Fructus* glaucus, ellipsoideus, circiter 1 cm. longus, longe stipitatus, stylo persistente 5 mm. longo coronatus. *Semina* nigra, 6·5 mm. longa, arillo coccineo.

South America. Bolivia: Yungas, fr., *M. Bang* 441. Corvico, May 1866, *Pearce* (type). Peru: near the River Alau, at the foot of Mt. Campana, in moist woods, fr., Nov. 1855, *R. Spruce* 4301.

This species will be found in herbaria under *B. frutescens*, which it resembles very closely. Their differences are shown in the key.

3. **Bocconia frutescens,** *Linn.* Sp. Pl. 505 (1753); Lam. Encyc. i. 432; Ill. t. 394; Descourt. Fl. Ant. i. t. 54; Macf. Jam. 22; Griseb. Fl. Br. W. Ind. 13; Urb. Symb. Ant. iv. 250; Fedde, Monogr. Papaveraceae, 216, partim.

B. glauca, Salisb. Prodr. 397 (1796). *B. quercifolia*, Moench. Meth. Suppl. 122 (1802). *B. sinuatifolia*, Stokes, Bot. Med. iii. 8 (1812). *B. subtomentosa*, L'Herit. ex Stahl, Estud. Fl. Puertorico Foll. ii. 34 (1884). *Bocconia ramosa*, etc., Plum. Gen. 35, t. 25 (1703). *Chelidonium majus arboreum*, etc., Sloan, Jam. 82; Hist. i. 196, t. 125 (1707).

Frutex; ramuli ultimi lanato-pubescentes. *Folia* inferiora petiolata, fere ad medium pinnatilobata, basi truncata vel rotundata, 15–35 cm. longa, 10–20 cm. lata, tenuiter membranaceo-chartacea, supra glabrescens, infra primum subdense demum laxe crispato-tomentosa, pallida, lobis oblongis subacutis repando-denticulatis; folia superiora minus lobata vel subintegra; petioli 3–7 cm. longi, tomentosi. *Panicula* usque ad 40 cm. longa,

laxe ramosa; bracteae oblongo-lanceolatae, acute acuminatae, pedicellis multo breviores, marginibus puberulis; pedicelli circiter 1 cm. longi, graciles, glabri. *Sepala* oblongo-elliptica, abrupte obtuse acuminata, circiter 1 cm. longa. *Stamina* circiter 16; filamenta filiformia, 3·5 mm. longa; antherae 6 mm. longae. *Ovarium* 4·5 mm. stipitatum, 3 mm. longum; stylus 1 mm. longus, stigmatibus 2·5 mm. longis recurvatis breviter tomentosis. *Fructus* anguste ellipsoideus, utrinque acutus, 7–8 mm. longus, carnosus, longe stipitatus, stylo persistente coronatus. *Semina* 6 mm. longa, leviter muricata, basi arillo crustaceo cincta.

West Indies. Cuba: *Wright* 6; rocky slope, San Antonio de los Banos, Havana Province, Mar. 1905, *A. H. Curtiss* 687. Jamaica: banks of rivers everywhere, *Purdie*; Moneague, Dec. 1849, *Alexander Prior*; St. Marys, 1839, *McNab;* without locality, *McFadyen*; *J. Bryce*; *Distin*; *Marsh* 876. Santo Domingo, *Schomburgk*; *Eggers* 1742. *Porto Rico*: *Sintenis* 181. Martinique: *Sieber* 129. Dominica: *Eggers* 4182.

Central America. Mexico: Tamasopo Canyon, San Luis Potosi State, shrub 5–15 ft., Nov. 1890, *E. G. Pringle* 3374. Vera Cruz, Mar. 1839, *Linden* 28. Vera Cruz to Orizaba, *F. Mueller.* Xalapa, Mar. 1840, *Galeotti* 7007. Vallee de Cordova, Jan. 1866, *Bourgeau* 1750; without definite locality, *Jorgensen* 492. Guatemala: Miseo, 2000 m., Apr. 1890, *Donnell Smith* 2177; Acatepeque, 1400 m., Mar. 1892, *Donnell Smith* 2505.

4. **Bocconia pubibractea,** *Hutchinson*, sp. nov.

Frutex sempervirens 5–6·5 m. altus (*Pearce*); ramuli ultimi primum lanato-pubescentes mox glabri. *Folia* inferiora petiolata, pinnatilobata, circiter 40 cm. longa et 18 cm. lata, membranaceo-papyracea, supra mox glabra, infra praesertim in nervis et venis lanato-pubescentia, lobis usque ad 4 cm. longis triangulari-oblongis apice rotundatis marginibus crenatis; folia superiora non visa; petioli 6–7 cm. longi, circiter 5 mm. lati, lanato-pubescentes. *Panicula* gracilis, laxiflora, circiter 40 cm. longa, ubique lanata; bracteae demum subglabrescentes, oblongo-lanceolatae, acute acuminatae, pedicellis multo breviores; pedicelli graciles, 1–1·5 cm. longi. *Sepala* obovato-elliptica, abrupte acute acuminata, 1 cm. longa, glabra. *Stamina* 10; filamenta filiformia, 1·5 mm. longa; antherae 4 mm. longae. *Ovarium* 3 mm. stipitatum, 2 mm. longum; stylus 2 mm. longus, stigmatibus 5 mm. longis recurvatis. *Fructus* ellipsoideus, carnosus, 1 cm. longus, siccitate valde rugosus, longe stipitatus, stylo persistente 7 mm. longo coronatus.

South America. Colombia: slopes of mountains about Muña, 2600–3600 m., May 1863, *Pearce* (type). Boqueron, mountains near Bogotà, 16 Nov. 1852, *J. F. Holton* 679; *Triana* 157. Andes of Popayan, 1700–2500 m., *Lehmann* 555; 5102.

5. **Bocconia latisepala,** *S. Wats.* in Proc. Am. Acad. xxv. 141 (1890); Fedde, Monogr. Papaveraceae, 219 (1909).

Herbacea usque ad 2 m. alta: rami juniores glabri, caeruleo-glauci. *Folia* inferiora longe petiolata, usque ad 25 cm. longa et 12 cm. lata, 3–4-pinnatilobata, tenuiter chartacea, supra glabra,

infra crispato-pubescentia, glauca, lobis lateralibus oblongis apice rotundatis remote et obscure denticulatis; petioli 5–5·5 cm. longi, longitudinaliter sulcati, glauci. *Panicula* usque ad 30 cm. longa, e basi laxe ramosa; bracteae oblongo-lanceolatae, subacutae, pedicellis multo breviores, marginibus puberulis; pedicelli 2–3 mm. longi, glauci, glabri. *Sepala* valde imbricata, late elliptica, circiter 6 mm. longa, abrupte acuminata, glabra, glauca. *Stamina* 12–14; filamenta filiformia, 1·5 mm. longa; antherae 4 mm. longae. *Ovarium* 3 mm. stipitatum; stylus 2·5 mm. longus, crassus, ramis curvato-divergentibus 3 mm. longis. *Fructus* 8–10 mm. stipitatus, nutans, ellipsoideus, carnosus, 1 cm. longus, stylo persistente 7 mm. longo coronatus, valvis demum deciduis. *Semina* ellipsoidea, 8 mm. longa, basi arillo crustaceo 2 mm. longo cincta.

Central America. Mexico: Guajuco, fl., *E. Palmer* 23. Nuevo Leon State; rich shaded canyons of the Sierra Madre, near Monterey, 3 July, 1888, *C. G. Pringle* 1907. *Hort. Gouan.*

6. **Bocconia integrifolia,** *Humbl. & Bonpl.* Pl. Aequin. i. 119, t. 35 (1805).

Frutex ramosissimus, usque ad 5 m. altus; ramuli juniores circiter 1·3 cm. crassi, farinaceo-pubescentes. *Folia* breviter petiolata, elongato-elliptica, apice triangularia, usque ad 30 cm. longa et 10 cm. lata, serrata vel crenata, rare apicem versus paucilobata, tenuiter chartacea, reticulata, supra glabra, infra albida, papilloso-puberula; costa infra valde prominens, basin versus sulcata: nervi laterales utrinsecus usque ad 18, leviter arcuati, bifurcati et multiramosi; petioli 2–3 cm. longi, supra concavi et dense lanato-tomentosi. *Panicula* multiflora, ad 35 cm. longa; bracteae inferiores foliaceae, magnae, ultimae oblongo-lanceolatae, subobtusae, glabrae, pedicellis dimidio breviores; pedicelli 5–7 mm. longi. *Sepala* obovato-elliptica, abrupte acuminata, 1 cm. longa, glabra. *Stamina* circiter 10; filamenta filiformia, circiter 2 mm. longa; antherae 5 mm. longae. *Ovarium* 3 mm. stipitatum; stylus 2 mm. longus, stigmatibus crassis valde recurvatis. *Fructus* carnosus, ellipsoideus, circiter 1·3 cm. longus. *Semina* oblongo-ellipsoidea, 6 mm. longa, basi arillo crustaceo verrucoso 2 mm. longo cincta.

South America. Colombia: Chipaque, Bogotà, 2400 m., *J. Triana.* Bogotà, Jan. 1846, young fr., *Purdie.* Bolivia: near Sorata, 2650–2800 m., Feb. Mar. 1860, *G. Mandon* 886. Peru: near Caseas, *Humboldt & Bonpland* (type)—not seen.

7. **Bocconia gracilis,** *Hutchinson*, sp. nov.

Rami crispato-pubescentes, internodiis circiter 1 cm. longis. *Folia* elliptico-oblanceolata, acute acuminata, basi breviter cuneata, 8–16 cm. longa, 3–6 cm. lata, chartacea, subduplicite repando-serrata, supra glabra, infra crispato-puberula; nervi laterales utrinsecus 9–12, arcuati, prominuli; petioli 2–2·5 cm. longi, minute puberuli. *Panicula* pauciflora, laxa, usque ad 20 cm. longa; bracteae lineari-lanceolatae, acutae, pedicellis dimidio breviores, extra minute puberuli: pedicelli 1–1·5 cm. longi, mox glabrescentes. *Sepala* obovata, abrupte acuminata, glabra, fere

1 cm. longa. *Stamina* 12; filamenta 2 mm. longa, filiformia: antherae 5 mm. longae. *Ovarium* 5 mm. stipitatum, 2 mm. longum; stylus 3 mm. longus, stigmatibus 3 mm. longis mox recurvatis. *Fructus* non visus.

Central America. Guatemala: Pansamalá, Alta Verapaz Department, 1300 m., fls. May 1887, *H. von Tuerckheim in Herb. Donnell Smith* 1236.

Mr. J. Donnell Smith has identified this species with the unpublished figure of *B. frutescens, var. cernua*, DC., in Mocino & Sessé Fl. du Mex. t. 14, which, however, differs in having lobed leaves.

8. **Bocconia glaucifolia,** *Hutchinson*, sp. nov.

B. integrifolia, var. *mexicana*, DC. Prodr. i. 121 (1824)?

Ramuli glabri, glauci, internodiis vix 1 cm. longis. *Folia* oblongo-oblanceolata, acute breviter acuminata, basi valde inaequalia et rotundata, 7–12 cm. longa, 2–4 cm. lata, tenuiter chartacea, serrata, glabra, infra conspicue glauca; nervi laterales utrinsecus 14–16, graciles, arcuati; petioli 1·5–2 cm. longi, glauci. *Panicula* pedunculata, usque ad 35 cm. longa, laxiflora; bracteae oblongo-lanceolatae, subobtuse acuminatae, ultimae circiter 5 mm. longae, glabrae; pedicelli circiter 8 mm. demum 10 mm. longi, robusti. *Sepala* late elliptica, subacute acuminata, circiter 1 cm. longa, glabra. *Stamina* circiter 12; filamenta filiformia; antherae 5 mm. longae. *Ovarium* 5 mm. stipitatum, 2 mm. longum; stylus 4 mm. longus, stigmatibus 4 mm. longis crassis spiraliter contortis. *Fructus* non visus.

Central America. Guatemala: San Miguel Uspantán, Quiché Department, about 2600 m., Apr. 1892, fl., *Heyde & Lux in Herb. Donnell Smith* 2899.

9. **Bocconia vulcanica,** *J. D. Smith* in Bot. Gaz. xvi. 1 (1891); Fedde, Monogr. Papaveraceae, 220 (1909).

Arbor; ramuli apice dense foliati, circiter 8 mm. crassi, glabri. *Folia* sessilia, obovata vel elliptico-obovata, subacute et abrupte acuminata, 10–14 cm. longa, 4 5·5 cm. lata, tenuiter chartacea, crebre et obtusissime serrata, utrinque glabra; nervi laterales numerosi, graciles, arcuati. *Panicula* densiflora, pedunculata, usque ad 25 cm. longa; bracteae oblongo-lanceolatae, acutae, pedicellis breviores, glabrae; pedicelli circiter 5 mm. longi, robusti. *Sepala* elliptica, caudato-acuminata, 1 cm. longa, subcoriacea, glabra. *Stamina* 10–15; filamenta filiformia, 2 mm. longa; antherae 5–6 mm. longae. *Ovarium* 2 mm. stipitatum, 3 mm. longum, glaucum; stylus crassus, 1·5 mm. longus, stigmatibus 3 mm. longis acutis. *Fructus* immaturus glaucus, carnosus.

Central America. Guatemala: Volcan de Agua, Zacatepequez, 3200 m., Apr. 1890, *Donnell Smith* 2172 (type).

Imperfectly known species.

B. ferruginea, *Koezl* in Belg. Hort. xxiv. 39 (1874)—Peru—nomen nudum.

Macleaya, *R. Br.* in Denham et Clapp. Narrat. Append. 218 (1826); Fedde, Monogr. Papaveraceae, 215 (1909).

Stamina 25–30; capsula oblanceolata, seminibus 4–6 ad suturas sessilibus ... 1. *M. cordata.*
Stamina 8–12; capsula orbicularis, semine solitario basifixo erecto ... ... 2. *M. microcarpa.*

1. **Macleaya cordata,** *R. Br.* l.c.; Franch. et Savat. Enum. Pl. Jap. i. 27 (1875); Fedde, Monogr. Papaveraceae, 216, Fig. 27, A–G, incl. var. *yedoensis,* Fedde (1909).

Bocconia cordata, Willd. Sp. Pl. ii. 841 (1797); Bot. Mag. t. 1905 (1817); DC. Prodr. i. 121 (1824).

China. Western Hupeh: *E. H. Wilson* (Veitch Exped.) 1403. Patung District, *A. Henry* 3162, 5213. Nanto and mountains to northward, *A. Henry* 1882. Shansi Province: Ta ho kuan, *F. N. Meyer* 1870. Chekiang: Hang-chow, *H. J. Hickin.* Hillsides, Chekiang, July 1854, *Fortune.*

Japan. Tokyo, *Science Coll. Imp. University (Japan) Herb.* Yokohama, *Maximowicz; Oldham* 216. Yokoska, *Savatier* 58. Aomori, *Faurie* 578. "Central Mts.," *Maries.*

2. **Macleaya microcarpa,** *Fedde* in Engl. Bot. Jahrb. xxxvi. Beibl. 82, 45 (1905); Monogr. Papaveraceae, 217, fig. 27, J–O (1909).

Bocconia microcarpa, Maxim. in Act. Hort. Petrop. xi. 45 (1889).

China. Eastern Kansu: *Potanin* (1885). *Hort. Kew.* 1895. Northern Shensi: *Giraldi* 760, 4468–4472 (ex Fedde).

XLV.—BAMBOOS AND BORING BEETLES.

L. A. Boodle & W. Dallimore.

The fact that Bamboos used in India for building purposes in the normal condition are very liable to injury by boring beetles, whereas those that have been well soaked in water before use are usually left alone, led to the following experiments being made with a view to determining the reason.

The material used in the experiments was grown in the Royal Botanic Gardens, Kew, part being examined in a fresh state, part after soaking for three months in the pond near the Palm House, and part after soaking for three months in water heated to 80° Fahr. in the tank in the Victoria Regia House, the examination in each case being conducted in the Jodrell Laboratory.

Examination of two portions of Bamboo stem (Dendrocalamus giganteus), from the Palm House, one fresh and one after being sunk in the pond near the Palm House for three months.

The untreated piece of stem contained abundant starch, and a considerable amount of soluble carbohydrate, consisting of or including glucose or some other sugar, giving a precipitate with Fehling's solution.

In the stem from the pond, soluble carbohydrate was present in

extremely small quantity, and may perhaps have consisted of glucose, as it may have been insufficient to detect by Fehling's reaction in the small amount of material used for examination. The quantity of starch is, on the whole, considerable, though decidedly less than in the other specimen, and also varying a good deal locally. Starch had practically disappeared from the cut end of the stem for a distance of 2–3 mm., and was most abundant towards the middle of the length of the specimen.

If the presence of a considerable amount of starch were a necessary condition of attack by the boring insect, the treated specimen would probably meet the requirements, but it must be remembered that the removal of starch from a piece of stem immersed in water might be more rapid in a hot climate.

The possibility that sugary contents might render the stem liable to attack is countenanced by the approximate absence of sugar in the soaked specimen. For comparison, a piece of small-stemmed bamboo (received from Mr. J. C. Fryer, Entomologist to the Ministry of Agriculture), actually attacked by *Dinoderus minutus*, F. (the commonest boring beetle attacking dry bamboo-stems in India, etc.), was examined. Sugar in this specimen was relatively scanty, but probably not sufficiently so to justify the rejection of sugar as a possible factor favouring attack. As far as nourishment is concerned, it may be supposed that certain kinds of boring beetles can obtain sufficient from the digestion of woody fibre, apart from the presence of sugar or starch.

The matter has been discussed with Mr. Fryer, who holds the opinion that scent is the special factor determining attack, that is to say that some odour, perceptible to the insect concerned, is the means by which it recognises the stem as bamboo, or as one of the plants which it attacks, and that if this scent is removed or sufficiently masked, the plant is avoided.

The effect of soaking in water might be to remove some chemical compound on which the odour depends, or, if the matter is one of masking, this might be due to an added scent, either produced by decomposition of some component of the wood, or absorbed from the water, if, for instance, the wood is sunk in a pond containing decaying organic matter.

The specimen from the pond had at first a very offensive smell, and still retains some of it, the smell being rather suggestive of organic sulphur-compounds. Though the mud of the pond may be responsible for this, it should be noted that a Bamboo (*Bambusa arundinacea*), is quoted as having a rather high sulphur-content in the ash of its leaves, 10·7 per cent. reckoned as SO_3, as against 3–6, representing commoner values.

Examination of sections of the same stem soaked in water at a temperature of 80° Fahr. for three months.

An experiment was also made by soaking pieces of bamboo in the *Victoria regia* tank for three months. This treatment was found to remove all the sugar present, but only a small proportion of the starch.

One may assume that, in the case of similar treatment in a hot climate, a stem, originally containing abundant starch, would

still contain plenty after soaking, but that all the sugar, or most of it, would disappear. It may be concluded also that immunity from attack would not be due to such reduction in starch-content as takes place, but that the removal of sugar may perhaps be the change which confers immunity.

The following experiment was carried out with a view to testing the value of these deductions:—

Three boring beetles (*Dinoderus minutus*), were placed in a corked glass-tube with three strips of bamboo. The pieces of bamboo were from a stem containing abundant starch and a considerable quantity of sugar. One of the strips was untreated, while the other two had been soaked in the pond, and had thus lost most of their sugar. After six days it was found that all three beetles had bored into the untreated piece, one having first made a short burrow in one of the treated pieces. The effect of soaking is thus comparable to that obtained in India. The fact that one beetle made a preliminary boring in a treated piece, when there was plenty of untreated bamboo at hand, does not appear to favour the suggestion, made in describing the first experiment, that immunity might depend on the removal or masking of some characteristic odour possessed by the bamboo. An increased probability therefore attaches to the view that the removal of sugar may be the determinant.

A second untreated strip was placed in the tube with the beetles; this also was attacked, a new brood of beetles was produced, and eventually the material of both untreated pieces became nearly exhausted, when a slight further attack of the treated piece took place.

Further experiments were prevented from being carried out by the death of the beetles.

The powder produced by the beetles in boring an untreated piece of bamboo, in which starch and sugar were abundant, was found to contain, besides the woody fibre, plenty of starch, but only a very small amount of sugar. Practically all this powder had no doubt passed through the alimentary canal of the insects, but some fragments which had not been ingested may have been present, and possibly the sugar detected may have belonged to these.

Further Experiments.

Four more beetles having been obtained, they were put into two jars with treated and untreated pieces of bamboo, three beetles in one jar (A), and one beetle in another jar (B). In both cases the piece of bamboo attacked by the insects was an untreated one containing plenty of starch and a considerable amount of glucose. In both cases also a small boring had been first begun in a treated piece from the same stem, that in jar B having been soaked in the pond, most of the glucose being thus removed, while the piece slightly bored in jar A was one which had been similarly treated and afterwards soaked in glucose solution (5 per cent.) and dried. Thus untreated material was preferred to treated, even when glucose had been restored to the treated bamboo. It is possible, however, that an unsuitable

amount of glucose may have been added, or that the re-sugared material may have been insufficiently dried.

It is to be noted that both the bamboo attacked and that visibly sampled by the beetles contained starch. The other pieces of bamboo included in the jars and apparently untouched were as follows:—In jar B.—Untreated pieces from two thinner-stemmed bamboos, having no starch and very little glucose. It is not surprising that these did not prove attractive. In jar A.—(1) Untreated, thin-stemmed, no starch and little sugar; (2) untreated, rather thin-stemmed, no starch, plenty of glucose; (3) thin-stemmed, no starch, originally very little sugar, but treated by soaking in glucose-solution; (4) thick-stemmed, soaked in *Victoria regia* tank, starch present.

The attack of starch-containing material and the absence of any boring in untreated bamboo, in which there was plenty of glucose but no starch, may indicate a preference for a diet containing starch. It is possible, however, that the sugary but starchless specimen was rejected because it was from a thin-stemmed bamboo. The fact that all the specimens definitely attacked, as well as those in which small borings were begun, were from the same thick-stemmed bamboo, may have some significance. Perhaps thick-stemmed material is chosen first for a trial, if at hand, or preference may be given to certain species of bamboo.

These later experiments scarcely help towards a general conclusion. The tentative boring of treated bamboo, however, is confirmed, and, as this was more than a mere tasting of the material, it appears that the bamboo was not unpalatable, but that the short boring probably served as a trial of its nutritive quality. The latter was apparently found to be below standard, presumably on account of the very small amount of sugar present. There is thus some probability that the removal of most of the sugar is the action by which soaking in water renders bamboo unattractive to boring beetles, and it may be supposed that the experiment with re-sugared bamboo was in some way an unsatisfactory one, perhaps owing to insufficient drying.

XLVI.—MISCELLANEOUS NOTES.

Mr. J. S. J. McCall, Director of Agriculture, Nyasaland Protectorate, has been appointed by the Secretary of State for the Colonies, Director of Agriculture in the Tanganyika Territory.

Mr. E. J. Wortley, F.C.S., Director of Agriculture, Bermuda, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture in the Nyasaland Protectorate, in succesession to Mr. McCall.

Mr. F. M. Rogers, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Head Gardener at the Amani Institute, Tanganyika Territory.

Mr. C. Matthews, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a Gardener in the United Provinces, India.

Mr. J. W. Besant, a former member of the gardening staff of the Royal Botanic Gardens, Kew, and for some time Foreman in the Royal Botanic Gardens, Glasnevin, has been promoted to the post of Assistant to the Keeper, Royal Botanic Gardens, Glasnevin.

Mr. James Reid, a probationer forester in the Royal Botanic Garden, Edinburgh, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Forest Officer in the Falkland Islands.

Lady Hanbury.—We record with deep regret the death of Katherine Aldam, Lady Hanbury, widow of Sir Thomas Hanbury, of La Mortola, on 2nd September, at Castle Malwood, Lyndhurst.

It was Lady Hanbury's constant care to maintain La Mortola as a garden of scientific value and to develop it on the lines laid down by Sir Thomas. This aim she fulfilled in a remarkable degree as she sought every means of enriching the collections and of making the resources of the gardens as widely available as possible. Among the latest interests was her desire to establish the Maté plant, *Ilex paraguayensis*, at La Mortola.

With Kew, Lady Hanbury always maintained very close associations, very greatly to the benefit of this institution, since she was always ready to supply specimens and seeds of rare and interesting plants from the collections. Kew was also able to communicate tender plants for trial in the open in the more genial climate of the Riviera.

It was characteristic of her generous and unselfish nature that she felt that her priceless heritage must be shared as fully as possible, and to this end both botanists and the public generally were given free access to the gardens. In addition to this the hospitality of La Mortola was extended by Lady Hanbury to many to whom the sunshine and ease might result in restored bodily health. To such guests the charm and kindness of their hostess must have ensured far more than physical betterment.

Of her kindly consideration and loving care for all her employees and for the villagers and peasants of La Mortola and the countryside, it is for others to speak, but her wonderful love

of doing good whenever possible, with a studied avoidance of all ostentation, will ever remain as a beautiful memory in the hearts of all those whose privilege it was to have known her.

Botanical Magazine.—The following plants have been figured in the six numbers for the months January to June of this year. *Stanhopea Costaricensis*, Reichb. f. (t. 8830) from Costa Rica; *Rhododendron Iedoides*, Balf. f. et W. W. Sm. (t. 8831) from Yunnan; *Ilex verticillata*, A. Gray (t. 8832) a native of Eastern North America; *Cornus Kousa*, Buerg. MSS. apud Miq. (t. 8833) from North Eastern Asia; *Rhododendron vernicosum*, Franch. (t. 8834) from Western China; *Erica Haroldiana*, Skan (t. 8835) from South Africa; *Primula pulvinata*, Balf. f. et Ward (t. 8836), a native of Yunnan; *Symphyandra asiatica*, Nakai (t. 8837) from Corea; *Paretta abyssinica*, Fresen. (t. 8838) from East Tropical Africa; *Pleurothallis punctulata*, Rolfe (t. 8839) from Colombia; *Ribes Jessoniae*, Stapf (t. 8840) from Western China; *Rhododendron serotinum*, Hutchinson (t. 8841) also a native of Western China; *Bulbophyllum macrobulbum*, J. J. Sm. (t. 8842) from New Guinea; *Hoheria populnea*, A. Cunn. var. *lanceolata*, Hook. f. (t. 8843) from New Zealand; *Iris Hoogiana*, Dykes (t. 8844) from Turkestan; *Venidium macrocephalum*, DC. (t. 8845) a native of South Africa; *Metrosideros collina*, A. Gray (t. 8846) from Polynesia; *Lilium Farreri*, Turrill (t. 8847) from China; *Salvia brevilabra*, Franch. (t. 8848) from Western Szechuan; *Ribes niveum*, Lindl. (t. 8849) a native of North-West America; *Podophyllum Emodi*, Wall. var. *chinense*, Sprague (t. 8850) from Western China, and *Rhododendron lutescens*, Franch. (t. 8851) also from Western China.

Sir J. D. Hooker.*—The Society for Promoting Christian Knowledge has published an admirable sketch of the life of Sir J. D. Hooker, by Professor F. O. Bower, which forms a volume of its "Pioneers of Progress" (Men of Science) series. In a paper wrapper it may be purchased for a shilling, and as the matter is compressed as much as possible, without, however, neglecting any of the more important features of Sir Joseph's long and active life, the volume may be read through in an hour or two. After a brief but interesting Historical Introduction, Professor Bower gives his record in chapters, entitled: Birth and Education, Foreign Travel, Kew, Authorship, The Species Question, Personal Characteristics, and Hooker's Position as a Man of Science. At the end is a useful list of the dates of the greater events in Sir Joseph's career, followed by a select list of his portraits and a brief bibliography. The portrait appearing in this volume has not, so far as we can ascertain, been published before.

We have noted a mistake regarding the area of Kew Gardens—a mistake so obvious that no reader knowing Kew at all well would

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* Joseph Dalton Hooker, O.M., &c., by Prof. F. O. Bower, Sc.D., F.R.S., London (S.P.C.K.), 1919, 62 pages and portrait. 1s. in paper wrapper, 2s. cloth.

be deceived by it. On p. 26 it is stated that "at the present day some 650 acres are under the Director's control." The precise area of the Gardens is 288 acres and 2 rods. A trivial slip occurs on p. 59. Sir Joseph's funeral took place on Friday, December 15, 1911 (not December 17).

Practical Plant Biochemistry.*—A proof of the advance in scientific knowledge within recent years has been the bridging over of many of the artificial gaps by which the various branches of science have been separated one from another. Correlated with this are the unexpected nature and the practical and academical importance of the discoveries which have been made in the past few decades on the borderland of two or more sciences. The result to the student of botany in particular has been an enormous increase in the subject matter with which he has to become acquainted. None of the more recent subdivisions of botany can show greater advance than plant chemistry, either in number or importance of discoveries. For this reason, if for no other, Mrs. Onslow's book "Practical Plant Biochemistry" would be welcomed. The work is primarily designed as a text-book for laboratory work, and in this respect is supplementary to "The Chemistry of Plant Products" by Haas and Hill. General statements and discussions are followed by definite instructions for enabling the student to extract from the plant itself the chemical compounds under consideration and to learn something of their properties. One hundred and fifty-eight such experiments are detailed. There is an all too brief chapter on "the Colloidal State," in which the general outlines of colloidal chemistry are given. This chapter might with advantage have been extended, although perhaps its subject belongs to physics rather than to chemistry. As one would naturally expect, consideration of the enzymes occupies a prominent place, and, besides a chapter on "Enzyme Action," the enzymes acting on each main group of compounds are considered after the chemical constitution of each group of compounds has been investigated. Thus we have carbohydrates and their hydrolyzing enzymes, fats and lipases, aromatic compounds and oxidizing enzymes, proteins and proteases, glucosides and glucoside-splitting enzymes. It would, perhaps, have unduly extended both the scope and the bulk of the book, but one cannot help feeling that it would have been more useful and certainly more interesting to the general botanist if fuller information from the physiological standpoint had been given and the position which the various compounds probably hold in the plant's system of metabolism indicated. A select bibliography is given at the end of each chapter.

W. B. T.

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* Practical Plant Biochemistry. Muriel Wheldale Onslow, Cambridge University Press, 1920. 15s.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9] [1920

XLVII.—FUNGI EXOTICI: XXV. NOTES ON UGANDA FUNGI.

II.—Microfungi.

E. M. Wakefield.

The present contribution towards a fungus-flora of Uganda enumerates a number of fungi, chiefly micro-forms, which occur on cultivated and wild plants, many of them as parasites. The list is compiled from records which have accumulated during the past six years, from collections made by Messrs. Dummer, Small, Maitland, and Snowden. A feature of the list is the large number of Uredinales, and it should be mentioned that in addition to those named many uredo-forms have been received which it has not been possible to identify satisfactorily.

The species of *Colletotrichum* on various hosts are listed separately, but as remarked under *C. incarnatum* it is probable that further work will show that many of these are identical. I am indebted to Mr. W. Small for correcting names of localities, and reading proofs.

Basidiomycetes.

Helicobasidium longisporum, *Wakef.* in *Kew Bull.* 1917, p. 310.

On root of young Cacao, Mvuba, Buganda, *Small* 463.

Ustilaginales.

Ustilago Cynodontis, *Bref.* Untersuchungen, XII, p. 105; *U. segetum* var. *Cynodontis*, Henn. in Engl. Bot. Jahrb. XIV, 1891, p. 369.

Fairly common on *Cynodon Dactylon*, Kampala, Jan. 1915, *Small* 166.

U. Digitariae, *Rabh.* Fung. Eur. No. 1199.

Fairly common on *Digitaria horizontalis*, Willd. Kampala, *Small* 5.

(1162.) Wt. 135—P. 47. 1,000. 10/20. J. T. & S., Ltd. G. 14. Sch. 12.

U. heterospora, *P. Henn.* in Engler, Pflanzenwelt Ostafr. 1895, p. 48.

Tilletia Ayresii, Berk. ex Mass. in *Kew Bull.* 1899, p. 146.

On *Panicum maximum,* Victoria Nyanza region, T. D. Maitland, 1914; on *Setaria aurea,* Nagunga, Dec. 1916, *Dummer* 3052.

U. Schweinfurthiana, *Thuem.* in Mycoth. Univ. No. 726.

On *Imperata arundinacea,* near Nkoko, Dec. 1916, *Dummer* 3057.

U. tritici (*Pers.*) *Jens.* in Kell. & Sw., Rep. Kans. Agr. Exp. Sta. II, 1890, p. 262.

On Wheat, Walasi, Bugishu, J. D. Snowden 529.

Sphacelotheca Reiliana (*Kühn*) *Clinton* in Journ. of Mycol. VIII, 1902, p. 141.

On Millet, S.E. Bugishu, foot-hills of Mount Elgon, *Small* 165.

S. Sorghi (*Link*) *Clinton* in Journ. of Mycol. VIII, 1902, p. 140.

On *Sorghum* sp., Kipayo, Nov. 1914, *Dummer* 1324.

Cintractia axicola (*Berk.*) *Cornu* in Ann. Sci. Nat. VI, 15, 1883, p. 279.

On a Cyperaceous plant, Kijude, *Dummer* 2516.

Tolyposporium philippinense, *Syd.* in Ann. Myc. X, 1912, p. 78.

On *Hyparrhenia cymbaria,* Stapf (=*Andropogon Cymbarius,* L.), Nagoge, Oct. 1916, *Dummer* 3011.

Schroeteria Cissi (*DC.*) *de Toni* in Sacc. Syll. VII, p. 501.

Kirerema, Nov. 1913, *Dummer* 617.

Uredinales.

Uromyces Bidentis, *Lagerh.* in Bull. Soc. Myc. Fr. XI, 1895, p. 213.

On *Bidens pilosa,* Kipayo, *Dummer* 1101.

U. Melantherae, *Cooke* in Grevillea, X, 1882, p. 127.

On *Melanthera Brownei,* Kipayo, *Dummer* 920; on *Melanthera,* Namanyonyi, Dec. 1915, *Dummer* 2753.

U. Ipomaeae (*Thuem.*) *Berk.* in Grevillea XI, 1882, p. 19.

On Convolvulaceae, Gegede, July 1916, *Dummer* 2874.

U. Secamones, *Wakef.* in *Kew Bull.* 1917, p. 311.

On *Secamone platystigma,* Namanyonyi, Oct. 1916, *Dummer* 3012.

Uromyces Hyperici-frondosi (*Schw.*) *Arth.* in Bull. Minnes. Acad. Nat. Sci., XI, 1883, p. 15.

On *Hypericum Lalandii,* Kirerema, Nov. 1916, *Dummer* 3017.

U. Polygalae, *Grove* in *Kew Bull.* 1916, p. 269.

On *Polygala* sp. Kipayo, *Dummer* 2324.

U. appendiculatus (*Pers.*) *Link,* Observ. II, 1816, p. 28.

On *Vigna sinensis,* Kamuli, 1913, Small 1; on *Phaseolus Munga,* Kipayo, *Dummer* 1121.

U. striatus, *Schroet.* Abhandl. Schles. Ges. f. vaterl. Cultur, 1869-72, p. 11.

On cultivated Lucerne, Mulange, Jan. 1920, *Dummer* 4420.

U. Hypoxydis, *Cooke* in Grevillea X, 1882, p. 127.
On *Hypoxis* sp., Kijude, *Dummer* 2508.
U. Aloës (*Cooke*) *Magn.* in Ber. deutsch. bot. Ges. X, 1892, p. 48.
U. aloicola, P. Henn. in Engl. Bot. Jahrb. XIV, 1891, p. 370.
On *Aloë* sp., Kipayo, June 1914, *Dummer* 903.
U. Commelinae, *Cooke* in Trans. Roy. Soc. Edinb., 1887, p. 342.
On *Commelina* sp., Kiwafu *Dummer* 919; Mabira Forest, near Mubango, *Dummer* 1331; Kirerema, *Dummer* 164.
U. Cyathulae, *P. Henn.* in Bull. Herb. Boiss., I, 1893, p. 107, and Sydow in Ann. Myc. V, 1907, p. 491.
On *Cyathula globifera,* Moquin, Kipayo, Sept. 1914, *Dummer* 1109.
Puccinia Berkheyae, *Wakef.* in *Kew Bull.* 1917, p. 312.
On *Berkheya Spekeana,* Namanyonyi, *Dummer* 2752.
P. Coreopsidis, *Wakef.* in *Kew Bull.* 1918, p. 209.
On *Coreopsis* sp., Kipayo, Sept. 1914, *Dummer* 1113.
P. Kalchbrenneri, *De Toni* in Sacc. Syll. VII, p. 645.
On *Helichrysum* sp., Kipayo, Nov. 1914, *Dummer* 1192; on *Helichrysum undulatum,* Lumbwa, May 1917, *Dummer* 3233.
P. Le-Testui, *Maubl.* in Bull. Soc. Myc. Fr. XXXII, 1906, p. 71.
On *Vernonia* sp., near Nkoko, July 1916, *Dummer* 2858.
P. pulvinata, *Rabh.* in Hedwigia, 1871, p. 20.
On *Echinops amplexicaulis,* Lumbwa, Oct. 1916, *Dummer* 3008.
P. holosericea, *Cooke* in Grevillea X, 1882, p. 126.
On Convolvulaceae, Kivuvu, Dec. 1914, *Dummer* 1319.
P. lateritia, *Berk. & Curt.* in Journ. Acad. Nat. Sci. Philadelphia, New Ser. II, 1853, p. 281.
On *Spermacoce Ruelliae,* DC., Kipayo, Dec. 1913, Dummer 616; on *Spermacoce* sp., Kirerema, *Dummer* 1470.
P. Oldenlandiae, *P. Henn.* in Engl. Bot. Jahrb., XV, 1892, Beibl. 33, p. 5.
On *Oldenlandia* sp., Kipayo, Jan. 1915, *Dummer* 1359.
P. pentadicola, *Grove* in *Kew Bull.* 1916, p. 271.
On *Pentas verticillata* var. *pubescens,* S. Moore, Mubango, *Dummer* 1344.
P. Pentadis-carneae, *Wakef.* in *Kew Bull.* 1916, p. 74.
On *Pentas carnea,* Kipayo, Oct. 1914, *Dummer* 1123.
P. Thunbergiae-alatae, *P. Henn* in Engler, Pflanzenwelt Ostafr., 1895, p. 50.
Uredo-stage on *Thunbergia alata,* Namanyonyi, Jan. 1916, *Dummer* 2739.
P. Hoslundiae, *Syd.,* Deutsch. Zentr.-Afr. Exped. 1907-08, II Band, p. 96; *P. Hoslundiae, Grove* in *Kew Bull.* 1916, p. 270.
On *Hoslundia* sp., Magigye, *Dummer* 1312.
This is the type material of Grove's species, but comparison with Sydow's description leaves no doubt that the names are synonymous. Grove states that the apex of the teleutospores is not thickened, but re-examination of the material shows that it

is sometimes slightly thickened, and this removes the only essential difference in the descriptions by the two authors.

P. leonotidicola, *P. Henn.* in Bot. Ergeb. der Kunene-Sambesi Exped. 1902, p. 3.

On *Leonotis* sp., Kipayo, Sept. 1914, *Dummer* 1108.

P. natalensis, *Diet. & Syd.*, in Hedwigia 1899, p. 130.

On *Lantana trifolia*, L., Kipayo, Nov. 1914, *Dummer* 1191.

P. accedens, *Syd.*, Monogr. Ured. I, 1902, p. 309.

On *Lippia arvensis*, Kipayo, Dec. 1914, *Dummer* 2301.

The mesospores are less numerous than is described in the Brazilian type.

P. necopina, *Grove* in *Kew Bull.* 1916, p. 271.

On *Tristemma* sp., Kipayo, *Dummer* 2325.

Puccinia Gouaniae, *Holway* in Ann. Myc. III, 1905, p. 21.

Uredo stage only, on *Gouania* sp., Kipayo, Jan. 1915, *Dummer* 1340.

P. aequalis, *P. Henn.* in Engler, Pflanzenwelt Ostafr., 1895, p. 50.

On *Antidesma venosum*, Kipayo, Jan. 1915, *Dummer* 2504.

P. Abutili, *Berk. & Br.*, in Journ. Linn. Soc. XIV, 1873, p. 91.

On Malvaceae, Kipayo, Nov. 1914, *Dummer* 1304.

P. heterospora, *Berk. & Curt.* in Journ. Linn. Soc., X, 1868, p. 356.

On *Abutilon* sp., Kipayo, May 1914, *Dummer* 647; on *Sida rhombifolia*, Namilyango, *Dummer* 1488; on *Sida* sp., Lake shore Entebbe, Mar. 1918, *Maitland* 253.

P. exilis, *Syd.*, Monogr. I, p. 481, var. **Hibisci,** *Grove* in *Kew Bull.* 1916, p. 270.

On *Hibiscus* sp., Kirerema, *Dummer* 2326.

P. leptosperma, *Syd.*, Monogr. Ured. I, 1903, p. 557.

On *Drymaria cordata*, Kivuvu, Dec. 1915, *Dummer* 2740.

P. Kraussiana, *Cooke* in Grevillea X, 1882, p. 126.

On *Smilax Kraussiana*, Kivuvu, *Dummer* 1116.

P. cymbopogonis, *Mass.* in *Kew Bull.* 1911, p. 224.

On *Cymbopogon citratus*, Kampala, *Small* 7; the type material of this species was from Entebbe.

P. graminis, *Pers.*, Disp. Meth. Fung., 1797, p. 39, and Syn. 1801, p. 228.

On native-grown wheat, Toro, *Small* 28; on wheat, Wazikonya's, Bugishu, *Snowden* 527.

P. triticina, *Eriks.* in Ann. Sci. Nat., Sér. 8, IX, 1899, p. 270.

On wheat, Kampala plantation, June 1920. *Snowden* 662.

P. Sorghi, *Schw.*, Syn. Fung. Amer. Bor., 1834, p. 295; *P. Maydis*, Bereng., in Atti VI Ruin, sc. ital. Milano, 1844, p. 475.

On cultivated maize, Mulange Estate, June 1919, *Dummer* 4163.

Pucciniosira Dissotidis, *Wakef.* in *Kew Bull.* 1917, p. 313.

On *Dissotis* or *Osbeckia* sp., Namanyonyi, July 1916, *Dummer* 2865; on *Dissotis incana*, Kipayo, *Dummer* 2157 (Aecidium).

Ravenelia minima, *Cooke* in Grevillea X, 1882, p. 128.

On *Albizzia Brownei*, Kipayo, Sept. 1914, *Dummer* 1107.

Hamaspora longissima (*Thuem.*) *Koern.* in Hedwigia XVI, 1877, p. 23.

On *Rubus sp.*, Mubango, Jan. 1915, *Dummer* 1343.

Hemileia Dioscoreae-aculeatae, *Rac.*, Crypt. paras. Jav. Exs., No. 37. *Uredo Dioscoreae-aculeatae*, Rac., Paras. Alg. u. Pilze Javas I, 1900, p. 30.

On *Dioscorea*, Kirerema, Nov. 1913, *Dummer* 619.

H. Scholzii (*P. Henn.*) *Syd.* in Engl. Bot. Jahrb. 45, 1910, p. 260.

On under surface of leaves of *Clerodendron*, Namanyonyi, *Dummer* 2751; Botanic Gardens, Entebbe, *Maitland* 229 partly; Kampala, *Small* 415.

H. vastatrix, *Berk. & Br.* in Gard. Chron. 1869, p. 1157.

On native and cultivated coffee, Kampala, *W. Small.*

Uredo mkusiensis, *P. Henn.* in Engl. Bot. Jahrb. 34, 1904, p. 41.

On *Psychotria* sp., Mulange, Mar. 1920, *Dummer* 4424.

This species is probably the uredo-stage of a *Hemileia.*

U. Pycnostachydis, *Kalchbr.* in Grevillea XI, 1882, p. 25.

On *Pycnostachys Dawei*, N.E. Br., Mugomba, May 1914, *Dummer* 648.

U. Gossypii, *Lagerh.*, in Journ. of Mycol. VII, 1891, p. 48.

On cultivated cotton, native garden, Kipayo, *Dummer* 2183.

U. Erythrinae, *P. Henn.* in Ann. Mus. du Congo, II, fasc. 3, 1908, p. 224.

On *Erythrina tomentosa*, Nov. 1914, Kipayo, *Dummer* 1311.

U. Zorniae, *Diet.* in Hedwigia 38, 1899, p. 257.

U. Zorniae, Berk. ex Cooke in Grevillea XX, 1892, p. 110 (*nomen nudum*).

On *Zornia* sp., Lumbwa, Sept. 1916, *Dummer* 3007.

U. Achyranthis, *P. Henn.* in Engler, Pflanzenwelt Ostafr. p. 51.

On *Achyranthes* sp., Kipayo, Jan. 1914, *Dummer* 1332.

U. Fici, *Cast.*, Cat. Pl. Marseill. II, p. 87.

On leaves of *Ficus* sp., Kipayo, Jan. 1915, *Dummer* 1334; Lumbwa, July 1916, *Dummer* 2870.

U. Dioscoreae, *P. Henn.* in Hedwigia, 1896, p. 255.

On *Dioscorea* sp., Lumbwa, June-July, 1916, *Dummer* 2856.

U. cypericola, *P. Henn.* in Engler, Pflanzenwelt Ostafr., p. 52.

On *Mariscus* sp., and *Mariscus Sieberianus* Nees, Kipayo, Oct. 1914, *Dummer* 1120, 1152.

U. digitariaecola, *Thuem.*, Mycoth. Univ. No. 2041.

On *Digitaria* sp., Kipayo, Aug. 1914, *Dummer* 949; on *D. digitata*, Stapf, Terinyi, Bukedi, Oct. 1917, *Snowden* 536.

Aecidium Vangueriae, *Cooke* in Grevillea X. 1882 p. 124.

On leaves of a Rubiaceous shrub, Bupoto, Bugishu, Nov. 1916. *J. D. Snowden* 490; on *Vangueria* sp., Bulago, Mount Elgon, July, 1917, *Snowden* 521.

A. flavidum, *Berk. et Br.* in Journ. Linn. Soc. XIV, 1873, p. 95.

On *Pavetta* sp., Mbarara, near Kivuvu, *Dummer* 3250.

A. acanthacearum, *Cooke* in Grevillea X, 1882, p. 124.
On *Justicia uncinulata,* Oliv. var. *tenuicarpa,* C.B. Cl., *Small* 18; Kipayo, *Dummer* 649; on *Justicia* sp., *Small* 19; Kipayo, *Dummer* 900, 902.

A. Leonotidis, *P. Henn.* in Engler, Pflanzenwelt Ostafr., 1895, p. 52.
On *Leonotis* sp., Magigye, *Dummer* 1482.

A. Phyllanthi, *P. Henn.* in Engl. Bot. Jahrb., XV, 1892, Beibl. 33, p. 6.
On *Phyllanthus* sp., Mulange, April 1919, *Dummer* 4022; Namanyonyi, Dec. 1916, *Dummer* 3055.
The spores in these specimens average rather smaller than those of the type form.

A. erythrobasis, *Berk. & Br.,* in Journ. Linn. Soc., XIV, 1873, p. 94.
On cultivated *Hibiscus* sp., Mugomba, Jan. 1915, *Dummer* 1346.

A. Glycines, *P. Henn.* in Engler, Pflanzenwelt Ostafr., 1895, p. 52.
On *Glycine javanica,* Kipayo, Aug. 1914, *Dummer* 926; *Dummer* 1193.

A. Crotalariae, *P. Henn.* in Engler, Pflanzenwelt Ostafr., 1895, p. 52.
On *Crotalaria* sp., Kampala, May 1915, *Small* 330.

A. Vignae, *Cooke* in Grevillea VIII, 1879, p. 71.
On *Pueraria phaseoloides, Vigna sinensis,* and *Vigna Catjang,* all imported from Java, Kampala plantation, *Small* 127, 128, 171 partly; on *Vigna* sp., *Small* 250 partly.

A. cookeanum, *De Toni,* in Sacc. Syll. Fung. VII, p. 822.
A. Loranthi, Cooke in Grevillea XIV, p. 13.
On *Viscum* sp., Kangage Forest, Mar. 1915, *Maitland* 122.

Perisporiales.

Erysiphe Polygoni, *DC.,* Fl. Fr. 2, 1805, p. 273.
On *Tephrosia paniculata,* Kipayo, *Dummer* 924; on *Vigna?,* Kipayo, *Dummer* 1105; on *Pisum sativum,* Mulange, Jan. 1920, *Dummer* 4417.

Eurotium herbariorum (*Wigg.*) *Link.* Spec. Plant. I, p. 79.
Ascigerous stage on leaves, *Small* 124.

Meliola clavulata, *Wint.* in Hedwigia 25, 1886, p. 98.
On *Convolvulaceae,* Magigye, *Dummer* 1483.

M. Molleriana, *Wint.* in Hedwigia 25, 1886, p. 98.
On *Hibiscus* sp., Kirerema, *Dummer* 1471.

M. bicornis, *Wint.* in Hedwigia 25, 1886, p. 99.
On *Glycine javanica,* Kipayo, *Dummer* 918; Kampala, *Small* 123; on *Teramnus labialis,* Lumbwa, July 1916, *Dummer* 2869.

M. clerodendricola, *P. Henn.* in Hedwigia 37, 1898, p. 288.
On leaves of *Clerodendron,* Botanic Garden, Entebbe, *Maitland* 229 partly, *Small* 461; on *Clerodendron capitatum,* Entebbe, 1919, *Maitland* 271.

M. Melastomacearum, *Speg.,* Fung. Puigg. 1889, p. 116.
On *Dissotis* sp., Kipayo, Sept. 1914, *Dummer* 1103.

M. palmicola, *Wint.* in Hedwigia 26, 1887, p. 31.

On dead *Phoenix reclinata* pinnae, Kipayo, Aug. 1914, *Dummer* 916.

M. Pazschkeana, *Gaill.*, Le Genre Meliola, 1892, p. 95.

On *Markhamia platycalyx*, Nagunga, Sept. 1914, *Dummer* 1112.

This form agrees with Gaillard's description, except that it has somewhat smaller spores than the type.

M. stenospora, *Wint.* in Hedwigia 25, 1886, p. 97.

On *Convolvulaceae*, Kirerema, *Dummer* 618; on *Piper* sp., Kipayo, *Dummer* 2168.

Parodiella melioloides (*B. & C.*) *Wint.* in Hedwigia 24, 1885, pp. 108, 257; Pat. in Bull. Soc. Myc. Fr., 8, 1892, p. 129.

On leaves of an unnamed plant, *Dummer* 159, 1117.

There is no doubt that *Exosporium lateritium*, Syd., described in Ann. Myc. XI, 1913, p. 407, represents the conidial stage of this plant. These specimens contained mostly conidia, but a few perithecia were found intermixed. The conidial stage was figured by Patouillard.

P. perisporoides (*B. & C.*) *Speg.*, Fung. Arg., Pug. I, 1880, p. 178.

Common on various *Leguminosae*. On *Crotalaria* sp., Kipayo, *Dummer* 1124; on *Indigofera subulata*, Namilyango, *Dummer* 1491; on unnamed legume, *Dummer* 1490; on *Vigna* sp., Kipayo, *Dummer* 1306; on *Tephrosia linearis*, Namanyonyi, *Dummer* 2749.

Corynelia uberata, *Fr.*, Syst. Myc. II, p. 535.

On leaves of seedling *Podocarpus nulangianus*, Entebbe, June 1917, *Maitland* 228.

Sphaeriales.

Ceratosphaeria lampadophora (*B. & Br.*) *Niessl.* in Verh. naturforsch. Ver. Brunn, XIV, 1876, p. 43.

Associated with *Hypoxylon* sp., Wakigu Forest, Feb. 1915, *Maitland* 95.

Eutypella corynostoma (*B. & Rav.*) *Sacc.*, Syll. I, p. 156.

On dead branch of *Albizzia moluccana*, Kampala, June 1915, *Maitland* 199.

Mycosphaerella conferta (*Speg.*) *Wakef.* Comb. Nov.

Sphaerella conferta Speg., Fung. Guar. Pug. I, 1883, p. 88.

On *Allophyllum* sp., Mulange, Jan. 1920, *Dummer* 4416.

Mycosphaerella depazeaeformis (*Ces. & de Not.*) *Wakef.* Comb. Nov.

Sphaerella depazeaeformis Ces. & De Not. Schem. Sfer. ital. in Comm. Soc. Critt. ital. I, part 4, 1863, p. 64.

On *Oxalis corniculata*, forma, Kipayo, Jan. 1915, *Dummer* 1333.

Mycosphaerella Erythrinae, *Koord.*, Bot. Unters. 1907, p. 189.

Common on *Erythrina tomentosa*, Kampala, Oct. 1914, *Small* 167.

Leptosphaeria Protearum, *Syd.*, in Ann. Myc. X, 1912, p. 441.

On *Protea madiensis*, Lumbwa, July 1916, *Dummer* 2863.

L. Sacchari, *v. Breda,* in Meded. v. Het. Proefstat. v. Suikerr. in West Java, 1892, p. 25.

On sugar-cane, common, *Small* 13.

Gibberidea Zingiberacearum, *Rac.* in Bull. Ac. Sc. Cracovie, 1909, p. 385.

On leaves of *Amomum* sp., Entebbe, *Maitland* 270.

Engleromyces Goetzei, *Henn.* in Engl. Bot. Jahrb. XXVIII, 1900, p. 327; *Colletomanginia paradoxa,* Pat. in Bull. Soc. Myc. Fr. Bamboo-zone, Mount Elgon, Dummer-Maclennan Exped. Jan. 1918, No. 3448.

This extraordinary plant has been received at Kew previously from the Aberdare Mountains, British East Africa, also on Bamboo. This is the first record from Uganda.

Rosellinia asperata, *Mass.* ex *Wakef.* in *Kew Bull.* 1918, p. 209.

On wood, Kampala, *Small* 315.

Ustulina vulgaris, *Tul.,* Sel. Fung. Carp. II, p. 23.

On dead stump of *Phoenix reclinata, Maitland* 306; *Dummer* 629.

U. zonata (*Lév.*) *Sacc.,* Syll. Fung. I, p. 352.

Mount Elgon, Dec. 1914, *Small* 136, 215; Namampe, May 1915, *Maitland* 192; Kipayo, *Dummer* 1453.

Dothideales.

Auerswaldia examinans (*Mont. & Berk.*) *Sacc.,* Syll. II, p. 626.

Mount Elgon, Dec. 1914, *Small* 135.

Dothidina disciformis, *Theiss. & Syd.* in Ann. Myc. XIII, 1915, p. 304; *Auerswaldia disciformis,* Wint.

On *Myrica* sp., Gegede, Mar. 1916, *Dummer* 2832.

Catacauma repens (*Cd.*) *Theiss. & Syd.* in Ann. Myc. XIII, 1915, p. 383.

Phyllachora repens (*Cd.*) *Sacc.,* Syll. II, p. 597.

On *Ficus* sp., Kipayo, Aug. 1914, *Dummer* 917.

C. ulcerata (*Mass.*) *Theiss. & Syd.* in Ann. Myc. XIII, 1915, p. 399.

Phyllachora ulcerata, **Mass.**

On *Ficus orata,* Vahl., leaves, Kampala, *Small* 17.

Phyllachora Desmodii, *P. Henn.* in Engler, Pflanzenwelt Ostafr. 1895, p. 34.

On *Desmodium* sp., Lumbwa, Mar.-April, 1916, *Dummer* 2841.

P. graminis (*Pers.*) *Fckl.,* Symb. Myc. p. 216.

On *Panicum* sp., Naminyama Hill, July 1916, *Dummer* 2889.

Hypocreales.

Nectria flavo-lanata, *Berk. & Br.* in Journ. Linn. Soc. XIV, 1873, p. 114.

On dead Cacao stem, Mabira Forest Plantation, Chagwe, July 1917, *Maitland* 227.

N. flavo-lanata resembles *N. tjibodensis,* Penz. & Sacc. in habit, but has broader (5–6 μ) and distinctly striate spores. Mixed with

the normal form in this material is a variety with spores 20–24 × 7–8 μ.

Petch has pointed out (Ann. Roy. Bot. Gard., Peradeniya, VII, 2, 1920, p. 103), that the spores of this species are subject to considerable variation. He thinks it probable that *N. floccu-lenta*, v. Hoehn., which only differs in the smaller spores, may be referred here. As the striation of the spores may also vary, it seems possible that *N. tjibodensis* may eventually be found to be also a form of the same species.

Nectria stigme, *Rehm* in Hedwigia XLIV, 1904, p. 2.

On *Ustulina zonata*, Kipayo, *Dummer* 629.

The spores of this specimen are slightly longer than those described, 5–8 × 4 μ.

N. Rickii, *Rehm* in Hedwigia XLIV, 1904, p. 2.

On *Hypoxylon* sp. on a tree-trunk serving as a bridge, Kisubi Forest, Aug. 1918, *Maitland* 310.

Spores 12 × 6·7 μ. In Saccardo's Sylloge Vol. XVII, p. 796 the descriptions of this and of the preceding species are trans-posed. In both the spores are brownish and warted when mature, but those of *N. Rickii* are larger. Probably they are merely forms of one species.

Calonectria guarapiensis, *Speg.*, Fung. Guar., Pug. I, 1883, p. 102.

On *Acalypha fruticosa*, Sai, Jan. 1915, *Dummer* 1336.

Megalonectria pseudotrichia, *Speg.*, Fung. Arg., Pug. IV, 1880, p. 82.

Common. Kipayo, *Dummer* 641, 1144; Kampala, *Small* 4, 292; Nakinyika Forest, *Maitland* 144; Namampe Forest. *Mait-land* 188.

Phycomycetes.

Rhizopus stolonifer (*Ehrenb.*) *Lind.*, Danish Fungi, 1913, p. 72.

On an Asclepiad, Kipayo, Nov. 1914, *Dummer* 1199.

Sphaeropsideae.

Phyllosticta Crotalariae, *Sacc.*, Syll. XXII, p. 1291.

The conidial stage of *Sphaerella Crotalariae*, Petch? *See* Petch in Ann. Roy. Bot. Gard. Peradeniya III. 1906, p. 2.

On *Crotalaria* sp., Kampala, May 1915, *Small* 329.

Phoma Heveae, *Petch* in Ann. Roy. Bot. Gard. Peradeniya, III, 1906, p. 5.

On dead twigs of *Hevea brasiliensis*, Kampala, 1913, *Small* 3.

Ascochyta phaseolorum, *Sacc.* in Michelia I, p. 164.

On leaves of *Vigna Catjang* imported from Java, and on *Vigna* sp., associated with *Aecidium Vignae*, Cooke, Kampala, *Small* 171, 250 partly.

Darluca Filum (*Biv.*) *Cast.*, Cat. Pl. Marseill. Sup. p. 53.

On *Imperata arundinacea*, Masindi, *J. D. Snowden*, 530.

Aschersonia Zenkeri, *P. Henn.* in Engl. Bot. Jahrb. XXIII, p. 541.

On *Fluggea microcarpa*, Nagoge, Jan. 1917, *Dummer* 3061 partly.

A. crenulata, *Pat. & Har.* in Journ. de Bot. XIV, 1900, p. 244.

A. tephrosiicola, P. Henn. in Ann. Mus. Congo II, fasc. 3, 1908, p. 228.

On *Fluggea microcarpa,* Nagoge, Jan. 1917, *Dummer* 3061 party.

Associated with the preceding species on the same leaves.

Septoria Chenpodii, *West.* in Bull. Acad. Sc. Bruxelles, XVIII, 1851, p. 396.

On cultivated *Chenopodium album,* Mulange, Feb. 1919, *Dummer* 3943. The spores are a little smaller than those of the European form.

S. Coffeae, *Wakef.* in *Kew Bull.* 1918, p. 210.

On leaves of coffee injured by hail, Kampala, *Small* 480.

S. nesodes, *Kalchbr.* in Grevillea IX, 1880, p. 20.

On *Hydrocotyle asiatica,* Kipayo, *Dummer* 1338, 1478.

Botryodiplodia Theobromae, *Pat.* in Bull. Soc. Myc. Fr., VIII, 1892, p. 136.

On fruits of a palm (*Raphia* sp.?), Wallasi, Bugishu, Oct. 1916, *J. D. Snowden,* 478, 482; on petiole of palm leaf, Kitibulu Forest, Dec. 1918, *Maitland* 392.

The specimens on palm fruits are the strongly-marked *Lasiodiplodia* form. Exactly the same form has been received from the Portuguese Congo on fruits of *Sclerospora Mannii.*

Hendersonia Protearum, *Wakef.* in *Kew Bull.* 1918, p. 210.

On leaves of *Protea madiensis,* Oliv., Lumbwa, July 1916, *Dummer* 2866.

Colletotrichum gloeosporioides (*Penz.*) *Sacc.,* Syll. III, p. 735.

On lemon leaves and twigs, Kampala, *T. D. Maitland.*

C. Camelliae, *Mass.* in *Kew Bull.* 1899, p. 91.

On leaves, twigs and seed-vessels of tea, Kampala, *T. D. Maitland.*

C. coffeanum, *Noack* in Zeitschr. f. Pflanzenkr., 1901, p. 202.

On twigs, leaves and berries of *Coffea arabica, C. robusta,* and *Coffea* sp., Kampala, *Maitland;* on coffee twigs, Toro, *Small* 532. Pure cultures of this species produce a *Glomerella* which is indistinguishable from *G. cingulata,* S. & v. Schr.

C. incarnatum, *Zimm.* in Centralbl. f. Bakt. u. Paras. 1901, p. 143.

On cocoa pods, causing hardening, Kampala, *Small* 481.

This species is supposed to be characterised by a blue coloration of the basal tissue when treated with iodine. In the present case this reaction was found to be not at all constant, and it is very probable that this and the following species are identical. Moreover, Small has found that *Colletotrichum coffeanum* from coffee will infect cocoa, and conversely. It seems probable that all these Colletotrichums of tropical economic plants may be forms of the ubiquitous *Glomerella cingulata.*

Colletotrichum theobromicola, *Del.* in Bull. Soc. Myc. Fr., XXI, 1905, p. 191.

On stems of Cacao, Kampala, *Maitland.*

Hyphomycetes.

Beniowskia Penniseti, *Wakef.* in *Kew Bull.* 1916, p. 75.

On *Pennisetum purpureum*, Schum., and *Sorghum vulgare*, *Small* 251.

Cercosporella Gossypii, *Speg.*, Fung. Guar., Pug. I, 1883, p. 162.

On cultivated cotton, native garden, Kipayo, *Dummer* 1335.

Periconia byssoides, *Pers.*, Syn. Fung. p. 686.

On coffee twigs, *Small* 29 partly, 31.

Helminthosporium Ravenelii, *Curt.* in Grevillea III, 1875, p. 102.

On *Eragrostis* sp., Lumbwa, Oct. 1916, *Dummer* 3005.

Cercospora personata (*B. & C.*) *Ell.* in Journ. of Mycol. I, 1885, p. 63.

Septogloeum Arachidis, Rac. in Zeitschr. für Pflanzenkr. 1898, p. 66.

On cultivated ground-nut, Kipayo, 1914, *Dummer* 1301; on cultivated *Cassia corymbosa*, Mukono, 1914, *Dummer* 1302.

C. sapiicola, *Speg.*, Myc. Arg. V, p. 442, in Ann. Mus. Nac. Buenos Aires XX, 1910.

On *Sapium Mannianum*, Mulange, Jan. 1920, *Dummer* 4413.

C. cannabina, *Wakef.* in *Kew Bull.* 1917, p. 314.

On cultivated Indian Hemp, Kipayo, Dec. 1914, *Dummer* 1320.

C. Cearae, *Petch* in Ann. Roy. Bot. Gar. Peradeniya, III, 1906, p. 10.

On cultivated Ceara rubber, Kipayo, *Dummer* 1495.

C. Henningsii, *Allesch.* ex *P. Henn.* in Engler, Pflanzenwelt Ostafr., I, p. 35.

Common on *Manihot utilissima*, Kampala, Oct. 1914, *Small* 170; Kipayo, Jan. 1915, *Dummer* 1348.

Cercospora coffeicola, *Berk. & Cooke* in Grevillea IX, 1881, p. 99.

On leaves of *Coffea stenophylla* and *Coffea* sp., Kampala, *Small* 322, 323, and 332; on nursery seedlings of coffee, Kampala, *Maitland.*

C. Chevalieri, *Sacc.* Syll. XXII, p. 1431.

C. Amorphophalli, Pat. & Har. in Bull. Soc. Myc. Fr. XXIV, 1908, p. 15.

On *Amorphophallus* sp. Namanyonyi, July 1916, *Dummer* 2879.

C. Raciborskii, *Sacc. & Syd.*, Syll. XVI, p. 1070.

On native-grown tobacco, Kampala, *Small* 15.

Macrosporium Brassicae, *Berk.* in Smith, Engl. Flor. V, p. 338.

On leaves of cabbage, Kampala, *Small* 324; Kipayo, *Dummer* 1499.

M. Solani, *Ell. & Mart.* in Amer. Nat. 1882, p. 1003.

On *Datura Stramonium*, Kampala, Oct. 1914. *Small* 173.

Tubercularia versicolor, *Sacc.* Fung. ital. tab, 961.

On the healing surface of tapped *Hevea*, Mubango, Dec. 1916, *J. D. Snowden*, 489.

The spores average slightly broader than those of the European form.

Tuberculina persicina (*Ditm.*) *Sacc.*, Fung. ital. tab. 964.

On *Cissus Afzelii*, with *Aecidium* sp., Kirerema, *Dummer* 2747.

Fusarium coffeicola, *P. Henn.* in Engl. Bot. Jahrb. XXII, 1895, p. 82.

On coffee twigs, Kampala, *Small* 29 partly.

F. heterosporum, *Nees,* in Nov. Act. Cur. IX, 1818, p. 235.

On *Panicum maximum*, common, Kampala, *Small* 8, 174; Kipayo, *Dummer* 1468.

Epicoccum vulgare, *Cd.*, Icon. Fung. I, p. 5.

Kipayo, *Dummer* 608.

Sterile mycelia.

Sclerotium Rolfsii, *Sacc.*

Associated with a wilt of Carnations, Kampala, May 1919, *Small* 534.

XLVIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamentum XI.

W. G. Craib.

Buettneria siamensis, *Craib* [Sterculiaceae-Buettnerieae]; species nova foliis haud lobatis, sepalis facie neutra glabris, petalorum appendicibus glabris, corona dorso haud rostrata cognoscenda.

Caules lignosi, volubiles, primo pilis stellatis brevibus ferrugineis sat dense instructi, mox puberuli, cortice brunneo vel rubro-brunneo tenuiter longitudinaliter striato obtecti. *Folia* ovata vel elliptico-ovata, rarius rotundato-ovata, apice caudato-acuminata, basi cordata, ad 20 cm. longa et 14 cm. lata, chartacea, supra ad costam nervosque laterales parce pubescentia, infra puberula nisi in nervorum axillis pilosa, e basi 7-nervia nervis duobus infimis intramarginalibus tenuioribus et brevioribus, nervis lateralibus (e costa ortis) utrinque 6. nervis omnibus supra conspicuis subtus prominentibus, nervis transversis numerosis supra conspicuis subtus prominulis, nervulis rete supra mox sat conspicuum efficientibus, margine integra, petiolo ad 11·5 cm. longo apice et basi incrassato subterete pilis stellatis brevibus parce vel subdense instructo striatulo suffulta, pulvino in ramulis brevibus valde prominente; stipulae cito deciduae, lineari-lanceolatae, pubescentes, circa 7 mm. longae. *Inflorescentia* axillaris, pedunculo communi circa 2·5 cm. longo suffulta, multiflora, pedicellis ad 8 mm. longis cum alabastris dense breviter griseo-puberulis. *Calyx* vix ad basem in segmenta 5 late lanceolata apicem versus gradatim angustata acuta 4·5 mm. longa 1·75 mm. lata divisus. *Petala* subviridia (ex *Kerr*), 2 mm. longa, appendice 3·5 mm. longa glabra instructa. *Antherae* filamentis brevibus suffultae.

Doi Sutep, 900 m., evergreen jungle, *Kerr* 3252.

Columbia Winitii, *Craib* [Tiliaceae-Grewieae]; ab affini *C. flagrocarpa*, C. B. Clarke, calycis indumento breviore inter alia distinguenda.

Arbor parva (ex *Winit*); ramuli iuventute densius pubescentes praetereaque pilis longis divaricatis sat numerosis conspicue instructi. *Folia* oblonga, apice caudato-acuminata, basi inaequaliter cordata, in ramulis floriferis ad 16 cm. longa et 8 cm. lata, alia 32 cm. longa et 15 cm. lata, chartacea, pilis stellatis supra parce subtus densius instructa, e basi 5–7-nervia, nervis supra conspicuis subtus prominentibus, nervis e costae parte superiore utrinque circa 5, nervis transversis inter se parallelis subtus prominulis, nervulis reticulationem gracilem subtus conspicuam efficientibus, margine denticulata et saepe apicem versus lobulata, ciliata, petiolo 5–24 mm. longo apice incrassato suffulta; stipulae reflexae, circa 6 mm. longae et 2·5 mm. latae, pubescentes, cito deciduae. *Inflorescentia* supra-axillaris et terminalis, foliis plus minusve dimidio brevior, e cymis racemosim dispositis constituta, pedicellis circa 4 mm. longis, bracteis deciduis. *Sepala* 5, oblongo-lanceolata, acuta, 5·5 mm. longa, 2 mm. lata, extra pubescentia, intra superne parce pubescentia. *Petala* oblanceolato-spatulata, 6·5 mm. longa, 1·5 mm lata, basem versus ciliata, intra basi pilosa et glandula elevata orbiculari circa 0·5 mm. diametro instructa. *Androgynophorum* 0·75 mm. longum, apice 10-lobulatum, ciliatum. *Stamina* numerosa, filamentis glabris. *Ovarium* dense pilosum; stylus 3·5 mm. longus, staminibus paulo longior, inferne pauci-pilosus.

Lampun, Mê Lee, 480 m., deciduous jungle, generally near streams; flower yellow, dotted scarlet, *Khun Winit* 340.

Lao name, Yarp-chăng: Yarp-sam-harng.

Acer Garrettii, *Craib* [Aceraceae]; species nova *A. philippino*, Merrill, similis, sed inflorescentia longiore haud glabra facile distinguenda.

Arbor ramulis glabris cortice brunneo vel fusco-brunneo obtectis sparse lenticellatis. *Folia* simplicia, opposita, oblonga, oblongo-elliptica vel oblongo-oblanceolata, apice acute obtuseve acuminata, rarissime rotundata, basi cuneata vel late cuneata, 6·5–15 cm. longa, 2·5–7 cm. lata, chartaceo-coriacea, glabra, subtus saepe albicantia, e basi trinervia, nervis basalibus lateralibus fere ad folii medium currentibus, nervis secondariis (e costa ortis) 3-5 supra conspicuis subtus prominentibus intra marginem anastomosantibus nervulis rete pagina utraque prominens sed inferiore laxius efficientibus, margine integra, incrassata, petiolo 2–5·5 cm. longo glabro apice paulo incrassato supra praesertim superne canaliculato suffulta. *Racemi* ♂ ex alabastris axillaribus apicem versus ramulorum orti, petiolis subaequilongi, praesertim superne pilosuli, pedunculo communi vix 1 cm. longo squamarum cicatricibus basi notato suffulti, pedicellis circa 5 mm. longis basi bractea parva decidua instructis. *Perianthii* segmenta 8, inter se subaequalia, lineari-lanceolata, circa 2·5 mm. longa, ciliata. *Stamina* 8, filamentis ad 4 mm. longis glabris. *Ovarii* rudimentum breve, dense sericeum.

Doi Intanon, Pah Ngeam, North Peak, 2070 m. Tree 61 cm. girth at 1·3 m. from ground, *Garrett* 77 (Fl. 21st Oct. 1910).

Leea pallida, *Craib* [Ampelidaceae]; species nova ramulis, petiolis, inflorescentiaeque ramulis pallide corticatis, foliis simpliciter pinnatis distincta.

Frutex circa 1·5 m. altus (ex *Kerr*), ramulis griseo-cinereo-corticatis glabris longitudinaliter striatis. *Folia* simpliciter pinnata, 38 cm. longa, petiolo communi 6 cm. longo longitudinaliter striato inferne late canaliculato suffulta, rhachi in sulco praesertim superne breviter pauci-pilosa et ad foliolorum insertionem inter petiolulos pilosa aliter glabra; foliola 7, oblonga, lanceolato-oblonga vel terminali oblongo-oblanceolato, apice acuminata, basi rotundata vel cuneato-rotundata, interdum parum inaequilateralia, terminali cuneato, ad 25 cm. longa et 7 cm. lata, chartacea, supra glabra, subtus pallidiora, ad costam nervos nervulosque setulosa, nervis lateralibus utrinque ad 15 supra conspicuis subtus prominentibus, nervulis transversis inter se parallelis supra subconspicuis subtus prominulis, reticulatione vix conspicua, margine distanter crassius serrata, praesertim inferne pauci-ciliata, petiolulo ·3–2 cm. longo vel terminali 25 mm. longo suffulta. *Inflorescentia* corymbosa. *Calyx* breviter lobatus. *Corolla* generis. *Discus* 1·75 mm. altus, in segmenta 5 apice breviter apiculata fere ad basem partitus. *Filamenta* 1·5 mm. longa, antheris oblongis subaequilonga.

Doi Sutep, mixed jungle, 450 m.; flowers greenish-white, *Kerr* 3390.

Viburnum Garrettii, *Craib* [Caprifoliaceae–Sambuceae]; ab affini *V. Colebrookiano*, Wall. indumento ramulorum et foliorum distinguendum.

Frutex grandis vel arbuscula (ex *Garrett*), ramulis iuventute dense fulvo-stellato-tomentosis demum glabrescentibus cinereo-brunneo-corticatis. *Folia* elliptica vel oblongo-elliptica, apice obtuse acuminata vel caudato-acuminata, basi late cuneata vel rotundato-cuneata, 7–21 cm. longa, 5–13 cm. lata, rigide chartacea, supra ad costam densius fulvo-subhirsuta, aliter pilis fasciculatis hic illic instructa, subtus pallidiora, ad costam nervos nervulosque stellato-furfuracea, nervis lateralibus utrinque ad 10–11 intra marginem ramosis supra conspicuis vel haud rarius parum impressis subtus prominentibus, margine crassius crenata vel serrato-crenata, petiolo ad 2 cm. longo primo dense fulvo-stellato-tomentoso supra conspicue canaliculato suffulta. *Infructescentia* et axillaris et terminalis, umbelliformis, ad 12 cm. diametro, pedunculo (primario) communi 4–7 cm. longo suffulta, pedunculis secondariis 3–5 ad 4 cm. longis, pedunculis tertiariis ad 2 cm. longis, pedunculis ultimis paucifloris vix 1 cm. longis, pedunculis omnibus furfuraceo-tomentellis, pedunculo communi apice bracteis duabus circa 5 mm. longis deciduis instructo. *Fructus* sessilis vel breviter pedicellatus, 5·5 mm. longus, calyce circa 0·75 mm. longo et stylo 1·75 mm. longo coronatus.

Mê Nya, Mê Karng, 840 m., hanging over streams, *Garrett* 102.

Diospyros Collinsae, *Craib* [Ebenaceae]; *D. Toposiae*, Ham. quoad folia similis sed calyce floris masculi valde diversa.

Arbor parva (ex *Collins*), ramulis glabris sicco iuventute fuscis mox cinereo-brunneis vel fere cinereis interdum subnitidis. *Folia* oblongo-lanceolata, oblonga vel oblongo-oblanceolata, apice saepe subacuminata, summo apice rotundata, truncata vel interdum retusiuscula, basi cuneata vel fere rotundata, usque ad 20 cm. longa et 6·8 cm. lata, coriacea, pagina utraque glabra, costa subtus prominente supra inferne canaliculata, nervis lateralibus utrinque circa 12 intra marginem anastomosantibus pagina utraque prominulis, nervulis rete utrinque prominulum efficientibus, margine integra, petiolo circa 1 cm. longo supra late haud alte canaliculato suffulta. *Inflorescentia* mascula axillaris, e parte interiore ramuli hornotini orta, e cymulis trifloris tribus constituta, pedunculo communi ad 1 cm. longo suffulta, pedunculis partialibus ad 5 mm. longis, flore terminali subsessili, floribus lateralibus breviter pedicellatis, bracteis cito deciduis. *Calyx* 4-merus, utrinque pilosulus, vix 1 cm. longus, lobis tubo plus minusve dimidio brevioribus imbricatis late deltoideis vel ovato-deltoideis apice obtusiusculis ciliolatis. *Corolla* alba (ex *Collins*), ima basi excepta extra adpresse pubescens, tubo e calyce paulo exserto, lobis 4 supra pilosulis 7 mm. longis 5 mm. latis. *Antherae* 16, per paria connatae, ad 5 mm. longae, apice longius attenuatae. filamentis vix 2 mm. longis glabris. *Ovarii* rudimentum conspicuum, pilosum.

Srirăcha (S. Siam), 4·5–6 m., *Mrs. D. J. Collins* 90, 423.

Diospyros similis, *Craib* [Ebenaceae]; ab affini *D. strigosa*, Hemsl., corolla longiore cognoscenda.

Arbor parva (ex *Kerr*); ramuli graciles, iuventute sat copiose brunneo-hirsuti, demum glabri, cinereo-corticati et fusco-lenticellati. Folia oblongo-lanceolata vel oblonga, apice longius attenuata vel acuminato-attenuata, summo apice acuta, basi rotundata vel subcordatula, rarius cuneata, usque ad 13·5 cm. longa et 4 cm. lata, rigide chartacea, supra primo parce pubescentia, mox glabra, subtus pallidiora, ad costam nervosque laterales hirsuta, aliter pubescentia, nervis lateralibus utrinque 7-8 intra marginem anastomosantibus supra conspicuis subtus prominentibus, margine integra, leviter recurva, iuventute longius ciliata, petiolo vix 5 mm. longo terete primo hirsuto demum glabro suffulta. *Flores* masculi albi (ex *Kerr*) gemini, axillares, ramulis hornotinis saepissime gesti, sessiles, basi perulis imbricatis apice rotundatis dorso medio adpresse ferrugineo-pubescentibus interioribus circa 2·5 mm. longis exterioribus conspicue maioribus instructi. *Calyx* dorso adpresse strigosus, intra glaber, 6 mm. longus, lobis 4 lanceolatis acutis 4 mm. longis. *Corolla* extra praesertim superne adpresse strigosa; tubus vix 9 mm. longus; lobi 4, oblongo-lanceolati, acuti, 5·5 mm. longi, circa 3 mm. lati. *Stamina* in fascicula trimera disposita, glabra, antheris angustis longe acuminatis.

Srirăcha, circa 30 m., evergreen jungle, *Kerr* 2112.

Diospyros viridis, *Craib* [Ebenaceae]; species nova foliis plus minusve oblongis acuminatis, floribus masculis axillaribus sessilibus, calyce minute denticulato, staminibus 20 per paria connatis cognoscenda.

Arbor circa 15 m. alta (ex *Kerr*), ramulis gracilibus glabris. *Folia* oblonga vel oblongo-lanceolata, apice acuminata, obtusa, basi cuneata, 10–17 cm. longa, 2·5–5·3 cm. lata, chartacea, glabra, subtus pallidiora, nervis lateralibus utrinque ad 14 intra marginem anastomosantibus supra subconspicuis subtus prominulis, nervulis reticulationem laxam subtus prominulam formantibus, margine integra saepius leviter recurva sed basi semper conspicue recurva, petiolo ad 1 cm. longo supra canaliculiato suffulta. *Flores* masculi albi (ex *Kerr*), in axillo quoque circa 5-fasciculati, sessiles, rhachi abbreviata breviter brunneo-pubescente. *Calyx* coriaceus, sicco ater, elongato-cupularis, dentibus brevibus inclusis 5 mm. longus, setulis paucis adpressis hic illic dorso instructus, dentibus densius breviter brunneo-pubescentibus. *Corollae* glabrae sicco fuscae tubus 7 mm. longus, lobis 5 lanceolatis obtusis circa 6·5 mm. longis. *Stamina* 20, per paria connata, antheris linearibus 3·5–4·5 mm. longis glabris breviter acuminatis filamentis brevibus glabris suffultis.

Chiengmai, Doi Sutep, evergreen jungle, 1670 m., *Kerr* 3198.

Symplocos Kerrii, *Craib* [Symplocaceae]; species nova foliis lanceolatis vel oblongo-lanceolatis acuminatis summo apice acutis, racemis simplicibus foliis circa duplo longioribus distinguenda.

Arbor parva vel mediocris (ex *Kerr*); ramuli subgraciles, iuventute brunneo-pilosuli, mox glabri vel fere glabri, brunneo-corticati. *Folia* lanceolata vel oblongo-lanceolata, acuminata, acuta, basi cuneata, ad 13 cm. longa et 3·5 cm. lata, rigide chartacea, supra viridia, glabra, subtus pallidiora, ad costam nervosque laterales sparse pilosa, aliter pilis sat longis distanter instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 9 intra marginem anastomosantibus supra conspicuis interdum leviter impressis subtus prominulis, margine revoluta, hydathodis conspicuis instructa; petioli circa 7 mm. longi, supra latius haud alte canaliculati, pilosi, sicco fuscescentes. *Racemi* axillares, simplices, petiolis circa duplo longiores, rhachi pedicellisque densius pallide brunneo-pilosulis, pedunculo communi abbreviato; bracteae deciduae, pedicellis fructus iuvenilis circa 1 mm. longis. *Receptaculum* circa 1 mm. altum, sericeum. *Calyx* 1·5 mm. longus, extra sericeus, intra glaber, tubo brevi, segmentis oblongis vel ovato-oblongis apice rotundatis pennicellatis circa 0·75 mm. latis. *Corolla* alba (ex *Kerr*), 5-partita, segmentis oblongis apice rotundatis 2·5 mm. longis 1·75 mm. latis, tubo 0·5–0·75 mm. longo. *Stamina* haud in phalanges aggregata, ad 4 mm. longa, glabra, antheris parvis. *Discus* conspicuus, pilosus. *Stylus* 3 mm. longus, glaber. *Fructus* immaturus ambitu oblongus, viridis, subsericeus, calyce persistente coronatus.

Doi Sutep, 900-1020 m., in evergreen jungle, *Kerr* 890, 2295.

Styrax casearifolia, *Craib* [Styracaceae]; species foliis oblongis vel ovato-oblongis, florum alabastris dense et longius pallide subhirsutis cognoscenda.

Arbor circa 9-metralis (ex *Kerr*); ramuli primo sat dense brevius furfuracei, demum plus minusve glabrescentes, cortice iuventute pallido mox brunneo vel rubro-brunneo longitudinaliter

fisso obtecti; alabastra axillaria duo, dense ferrugineo-furfuracea, superiore distincte stipitato. *Folia* oblonga vel ovato-oblonga, apice plus minusve distincte acuminata, summo apice costa excurrente apiculata, basi parum inaequilateralia, late cuneata vel interdum rotundata, usque ad 12 cm. longa et 5 cm. lata, rigide chartacea, supra viridia vel plus minusve brunnescentia, pilis paucis brevibus stellatis instructa, subtus pallide viridia, pilis iisdem sed paulo densius instructa praetereaque in nervorum axillis pubescentia, nervis lateralibus utrinque 5–6 sat obliquis supra conspicuis vel prominulis subtus prominentibus, nervis transversis subtus prominulis, margine anguste serrulata; petioli circa 5 mm. longi, supra late canaliculati, sicco brunnescentes. *Inflorescentia* e racemis brevibus in ramulis axillaribus inferne foliiferis racemosim dispositis constituta; bracteae angustae, circa 5 mm. longae; alabastra densius subhirsuta, pedicellis ad 4 mm. longis suffulta. *Corollae* lobi valvati. *Fructus* griseus, ellipsoideus, circa 1·2 cm. longus, pericarpio irregulariter fisso.

Doi Wao, 900 m., edge of clearing in evergreen jungle, *Kerr* 2432.

Stemona Collinsae, *Craib* [Roxburghiaceae]; a *S. Kerrii*, Craib, habitu, nervis transversis haud tam approximatis subtus haud pilosis differt.

Caulis simplex, erectus (an semper?), sicco iuventute griseo-viridis, mox stramineus, striatulus, longitudinaliter denticulatus, 40 cm. altus. *Folia* inferiora ad squamas deltoideas stramineas redacta, normalia ovata, apice caudato-acuminata, summo apice nervo excurrente mucronata, basi cordata, ad 10 cm. longa et 7 cm. lata, membranaceo-chartacea, supra viridia, glabra, subtus pallidiora, ad nervos minute scaberula, e basi 13-nervia, nervis supra impressis subtus prominentibus, nervis transversis gracilibus numerosis pagina utraque conspicuis, petiolo apice basique incrassato 5-7 cm. longo suffulta. *Flores* viridi-lactei (ex *Collins*), in axillis foliorum et squamiformium et normalium solitarii, vel interdum in axillis superioribus racemosim dispositi, pedicellis 2·5–4·5 cm. longis 6–7 mm. infra apicem articulatis apice incrassatis suffulti. *Perianthii* segmenta ad 1·7 cm. longa et 7·5 mm. lata. *Antherae* elongatae, perianthii segmentis subaequialtae, filamentis brevibus inferne complanatis suffultae. *Ovarium* generis, ovulis paucis.

Srirăcha, on bank above beach, *Mrs. D. J. Collins* 399, 131; in mixed jungle close to sea-shore, *Kerr* 4241.

XLIX.—DISEASES OF THE OIL PALM IN WEST AFRICA.

E. M. Wakefield.

(With Plate.)

While there is a considerable amount of literature dealing with diseases of the coconut palm, some of which, as bud-rot, are very destructive, very little is known of diseases and pests of the oil-palm. Hitherto, in fact, this palm does not appear to have suffered greatly from the attacks of insect or fungoid enemies, no doubt largely because in West Africa, even if not indigenous, it appears to enjoy optimum conditions of soil and climate. During the past few years, however, various records of diseases of the oil-palm in West Africa have accumulated. It may be that with the increasing economic importance of the plant more attention is being paid to injurious parasites. On the other hand it is quite possible that the parasites which attack the coconut and certain other palms are at length adapting themselves to the oil-palm, and if so it is important for the oil-palm industry that attention should be called to this source of danger.

Information is as yet very incomplete, but it is hoped that a summary of such facts as have come to the knowledge of Kew may serve to draw attention to the matter, and lead to an extension of our knowledge.

Good specimens of fungi suspected of attacking the oil-palm and photographs of typical diseased palms, together with as many observations as possible as to method and conditions of attack, would be most welcome in this connection.

I. *Rot of trunk due to Ganoderma* sp.

In 1915 a report was received from Messrs. Lever Bros. concerning a fungus attacking oil-palms on their estate at Leverville, Congo. Specimens of the fungus were sent, and although it was obviously a *Ganoderma*, near to *G. lucidum*, the material was unfortunately too old and decayed for certain specific identification. As far as could be judged it seemed to agree best with *G. tumidum*, Bres.

This fungus was stated to be very common in the district and widely distributed. It attacked the base of the trunk and was most frequently seen on mature trees, but was also observed to attack and kill young trees. After the death of the tree the fungus persisted for an indefinite period as a saprophyte, thus providing a continual source of infection. Moreover, when the roots of dead trees were "grubbed" out it was noticed that much mycelium persisted in the soil. In the same report it was mentioned that certain species of beetles bore holes into the base of the palms, and may provide access for the spores.

No further information was obtained as to this case, but in 1917 the late Mr. C. O. Farquharson, mycologist for S. Nigeria, reported that he had found a few oil-palms at Awka and Agwoba dying from attack by *Ganoderma lucidum*, Karst. (= *Fomes lucidus*, Fr.). They were old trees, and had probably been

To face page 307.]

weakened by tapping for wine; he did not consider there was any likelihood of the fungus becoming epidemic.

This fungus, *G. lucidum*, also attacks the Coconut palm, the Areca palm, and probably others, and is a common saprophyte all over the world. It seems to be only an occasional wound-parasite, but even so it may possibly cause considerable loss in districts where it is abundant.

Recently notes and photographs have been received from Mr. R. Swainson Hall, of Cabinda, Portuguese Congo, of a disease on oil-palms there caused by a species of *Ganoderma* which he also regards as *G. lucidum*. This fungus causes a rot of the internal tissues near the base of the trunk, and is said by Mr. Swainson Hall to be very destructive. The photographs reproduced as plates show a healthy (left) and diseased (right) palm side by side, Plate II. fig. 1, and sporophores of the fungus at base of trunk, Plate II. fig. 2.

In L'Agronomie Coloniale, Vol. IV. No. 30, 1920, pp. 187-191, Maublanc and Navel have described a similar disease of the oil-palm in the islands of San Thomé and Principe off the West Coast of Africa. The fungus causes a rot, and eventually produces a large cavity at the base of the trunk. In this case the causative agent was identified by Patouillard as *Ganoderma applanatum*.

From these various records it is obvious that there is widely spread in West Africa a trunk-rot of *Elaeis guineensis* due to a species of *Ganoderma*. There is some doubt as to whether one or more species of *Ganoderma* is concerned. The names *G. tumidum* (?), *G. lucidum*, and *G. applanatum* have been applied, but *a priori* it would seem more probable that only one species is really parasitic. It is very desirable therefore that the fruit-bodies of any fungi suspected of causing disease, when in good condition, should be collected and sent to some recognised systematist for identification.

Whatever may be the species of *Ganoderma*, however, the remedial measures to be taken would be similar, namely, the grubbing out and burning of attacked trees, and the isolation of diseased areas by deep trenches. As far as is practicable the production of wounds in the process of "cleaning" should be reduced to a minimum. Although it is unlikely that infection by these trunk-rotting fungi ever takes place through the crown, such wounds may offer entrance to other organisms. Obviously, also, felled trunks should not be left lying for any length of time, or a crop of sporophores would be produced from which new spore-infections might take place.

II. *Bud-Rot?*

Hitherto the disease known as "Bud-Rot" has only been known to attack the Coconut Palm. In a report dated Nov. 22, 1917, on the occurrence of disease in Coconut and Oil Palms in the Southern Provinces of Nigeria, Mr. C. O. Farquharson pointed out that should a specially virulent strain of the organism of bud-rot ever become evolved, capable of attacking the Oil-palm, the practice of cabbage-tapping provides an easy mode of entrance. Mr. Farquharson recommended that cabbage-tapping should be

rigorously suppressed, and that *all* tapping for wine should be prohibited in districts where coconut bud-rot exists.

In view of this warning, it is disquieting to note that Mr. Swainson Hall has reported the existence of a disease of Oil-palms in the Portuguese Congo which suggests very strongly "bud-rot." He states that the disease attacks the palms during the period of fruit-bearing. Young bunches of fruits ripen prematurely, and eventually become dried up. The leaf-bases of the younger leaves are infected, and in the course of six to eight weeks the leaves wilt and fall over, finally breaking away. The disease eventually reaches the soft, succulent growing-point, which rots away, and emits an exceedingly foul odour. Attacked palms never recover.

No confirmatory evidence as to the nature of this disease has been obtained, but the symptoms, especially the evil-smelling rot of the growing-point, are certainly indicative of Bud-rot whatever the cause of the disease may be. No such disease has as yet been reported from any other districts.

III. *Boring beetles.*

In connection with the possible spread of fungus diseases, in particular *Ganoderma lucidum* and other trunk-rotting species, by means of beetles, it is interesting to note that a beetle which was found by Mr. Swainson Hall to be doing considerable damage to Oil-palms has been identified by Dr. Guy Marshall as *Oryctes owariensis*, P. de B. Mr. Hall states that since the beginning of the year he has cut down and destroyed 40 trees attacked by this beetle, which attacks not only the trunks but also the top of the palm. It is probable that the adoption of measures to decrease the numbers of these beetles would also be of use in checking the spread of certain fungus diseases.

L.—STELLARIA OR ALSINE.

T. A. Sprague.

The name *Alsine* has been applied to three distinct genera, namely, *Minuartia*, *Stellaria* and *Spergularia*. Thus *Alsine* of Gaertner, Wahlenberg, Fenzl, Asa Gray, Boissier, Nyman and the great majority of authors is *Minuartia*, Linn.; *Alsine* of Britton, Small and other American botanists is *Stellaria*, Linn.; and *Alsine* of Reichenbach, Hiern and Groves is *Spergularia*, J. & C. Presl.

It will be generally admitted that such divergence of usage is to be deplored, and the following account of the history of *Alsine* has been drawn up in the hope that some agreement may be arrived at as to the incidence of the name or its relegation to synonymy.

The genus *Alsine*, Linn. (Pentandria Trigynia), appeared in the Species Plantarum, ed. 1, p. 272 (1753), and Genera Plantarum, ed. 5, p. 132 (1754). The generic description is as follows:—

Cal. *Perianthium* pentaphyllum: Foliolis concavis, oblongis, acuminatis.

Cor. *Petala* quinque, aequalia, calyce longiora.

Stam. *Filamenta* quinque, capillaria. *Antherae* subrotundae.

Pist. *Germen* subovatum. *Styli* tres, filiformes. *Stigmata* obtusa.

Per. *Capsula* ovata, unilocularis, tecta.

Sem. plurima, subrotunda.

As first constituted, *Alsine* included two species: 1, *A. media*, Linn. (*Stellaria media*. Vill.); 2, *A. segetalis*, Linn. (*Spergularia segetalis*, G. Don.). Linnaeus subsequently added a third species, *A. mucronata*, in Species Plantarum, ed. 2, p. 389 (1762). This has been identified by different authors with *Alsine fasciculata*, *A. rostrata*, *A. tenuifolia* and *A. arvatica*, all of them species of *Minuartia*, Linn.

Thus *Alsine* Linn. (1753) = *Stellaria* + *Spergularia* (*Delia*); and *Alsine*, Linn. (1762) = *Stellaria* + *Spergularia* + *Minuartia*. It included all Alsineae known to Linnaeus which had 5 stamens and 3 styles, and was a thoroughly artificial genus, as was pointed out by Stokes in 1787.* It differed from *Arenaria*, Linn., in having five instead of ten stamens. This is illustrated by the history of *A. mucronata:* Linnaeus originally included this species in Sp. Pl. ed. 1, p. 424, as *Arenaria mucronata* (Decandria Trigynia), because Haller had placed it in Diplostemones;† he transferred it to *Alsine* (Pentandria Trigynia), in Sp. Pl. ed. 2, p. 389, on the strength of Seguier's statement that the species had only five stamens.‡

Alsine, Linn., was disintegrated in 1789 by Villars, who transferred *A. media*, Linn., to *Stellaria; A. segetalis*, Linn., to *Spergula;* and *A. mucronata*, Linn., to *Arenaria*, as a synonym of *Arenaria tenuifolia*. The Linnean genus thus disappeared completely.§

In 1791, however, Gaertner recognised that *Alsine mucronata* differed generically from *Arenaria* in its three-valved capsule, and revived the genus *Alsine*, with *A. mucronata* as its type species.‖ Wahlenberg in 1812 accepted Gaertner's definition of *Alsine*,¶ and in 1831 included *Lepigonum* (*Spergularia*) in the genus.** Finally, Fenzl in 1840 reduced *Minuartia*, Linn. (1753) and *Cherleria*, Linn. (1753) to *Alsine*, Wahlenb. (1812), and excluded *Spergularia* and *Honkenya*.†† The generic name *Alsine* has been used in the same sense by Asa Gray, Boissier and Nyman, and in most of the standard European floras of the nineteenth century.

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* Withering, Arr. Brit. Pl. ed. 2, i. p. 323 (1787).
† Enum. Stirp. Helvet. p. 389, n. 13 (1742).
‡ Seguier, Pl. Veron. iii. p. 175 (1754).
§ Hist. Pl. Dauph. iv. pp. 615, 628, 634, 636, 657 (1789).
‖ De Fructibus, ii. p. 223 (1791).
¶ Fl. Lapp. p. 127 (1812).
** Fl. Suec. i. p. 290 (1831).
†† Endl. Gen. Pl. p. 964 (1840).

As the Linnean genus *Alsine* originally included only a species of *Stellaria* and one of *Spergularia* (*Delia*), it is clearly contrary to the recognised rules of nomenclature to use the Linnean name for a third genus (*Minuartia*). This was realised by Reichenbach, who in 1832 restricted the Linnean genus *Alsine* to *Spergularia*, Pers., and proposed a new genus, *Sabulina*, to receive *Alsine mucronata* and its congeners.* After Fenzl had reduced *Sabulina* and *Minuartia* to sections of *Alsine*, Wahlenb.,† Reichenbach divided *Sabulina* into two genera, *Sabulina* (= *Alsine*, series *Sabulineae*, Fenzl) and *Minuartia* (= *Alsine*, series *Minuartieae*, Fenzl).‡

The generic name *Alsine*, Wahlenb., remained in general use, however, until 1899, when Hiern pointed out that it should be replaced by *Minuartia*, Linn.§ *Minuartia* has been accepted by H. and J. Groves, ‖ Britten and Rendle,¶ Schinz and Thellung,** Hayek,†† Briquet,‡‡ Graebner,§§ and others, and should supersede *Alsine*, Wahlenb.

Moss, however, has retained *Alsine*, Wahlenb., and claims that his position is in accordance with the general aims and spirit of the International Rules. ‖‖ As *A. mucronata* was not included in *Alsine* until the second edition of the Species Plantarum, the acceptance of *Alsine*, Wahlenb., is contingent on the adoption of 1762 as the starting point of botanical nomenclature, which is contrary to the International Rules and the American Code. It further implies the acceptance of what may be termed the principle of "generic residues" in lieu of that of "generic types." Instead of attempting to determine the type of the Linnean genus *Alsine*,¶¶ Moss starts with the Species Plantarum, ed. 2, excludes *A. media* from consideration because it has been transferred to *Stellaria*, and *A. segetalis* because it is now generally placed in *Spergularia* (a nomen conservandum), and treats the residue, namely, *A. mucronata*, as the type of the genus.

The principle of "generic types," on the other hand, is admirably presented in the regulations for fixing generic types proposed by a committee of the Botanical Society of America :***

Article 1. The application of generic names shall be determined by type species.

Article 2. The type species shall be the species or one of the

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* Fl. Germ. pp. 566, 785 (1832).
† Endl. Gen. Pl. p. 964 (1840).
‡ Nomencl. pp. 204, 205, nn. 7767, 7768; Ic. Fl. Germ. v. pp. 27, 28 (1841).
§ Journ. Bot. 1899, p. 320.
‖ Babington, Man. Brit. Bot. ed. 9, p. 60 (1904).
¶ Brit. Mus., List Brit. Seed-plants, p. 6 (1907).
** Bull. Herb. Boiss. Sér. 2, vii. p. 402 (1907).
†† Fl. Steiermark, i. p. 270 (1908).
‡‡ Prodr. Fl. Corse, i. p. 529 (1910).
§§ Syn. Mitteleur. Fl. v. p. 698 (1918).
‖‖ Journ. Bot. 1914, p. 196.
¶¶ It is shown below that *A. media* was the type.
*** Science, n.s. xlix. pp. 333-336 (1919).

species included in the genus when originally published (publication of the genera of seed plants dating from the issue of Linnaeus's "Species Plantarum" in 1753).

The remaining Articles are concerned with the principles which should be followed in determining the types of genera, and are framed in such a spirit as to warrant the hope expressed that an international agreement upon the types of all genera may be arrived at.

Moss suggested that *Alsine*, Wahlenb., should be treated as a nomen conservandum under Article 20 of the International Rules. Had *Alsine* been a *new* generic name proposed by Wahlenberg, more might be said in favour of this course. What it would really amount to is the supersession of *Minuartia*, Linn. (1753), a generic name about which there is no ambiguity, by *Alsine*, Linn. (1762) pro parte, non Linn. (1753).

A new generic name, *Alsinopsis*, was proposed for *Alsine*, Wahlenb., in 1903 by Small,* who was perhaps unaware that the genus in question already possessed seventeen names, two of which date from 1753. Even if Fenzl's sections of *Alsine* are regarded as independent genera, the generic names *Alsinanthe*, Reichb., and *Mononeuria*, Reichb. (*see* below) are available for the North American species.

The synonymy of *Alsine*, Wahlenb. was given in some detail in Dalle Torre et Harms, Gen. Siphonog. p. 157 (1900), but the genus was attributed erroneously to Scopoli (as in the Index Kewensis), three synonyms were omitted, and *Gypsophytum*, Adans. was quoted as a synonym. But *Gypsophytum* was described by Adanson as having a 6-valved capsule,† and was based on six species,‡ three of which are now included in the genus *Arenaria*, namely: *Arenaria serpyllifolia*, *A. saxatilis* and *A. aggregata*. The remaining species are *Moehringia trinervia*, *Minuartia tenuifolia* and *Cerastium strictum*. *Gypsophytum* was thus a mixture of four genera, but was mainly *Arenaria*, Linn., and Adanson gives a cross reference from *Arenaria*, Linn. to *Gypsophytum*.§

Although for convenience' sake the writer has hitherto referred to *Alsine*, Wahlenb. in accordance with the usual custom, the genus should really be ascribed to Gaertner, who was the first to distinguish it by the number of the capsule valves, and gave *A. mucronata* as the type species. Wahlenberg himself quoted Gaertner's description and figure as defining the genus.‖

In view of the confusion of nomenclature it may not be superfluous to give the principal synonymy of *Minuartia*, Linn.

Minuartia, *Linn.* Sp. Pl. ed. 1, p. 89 (1753); Gen. Pl. ed. 5, p. 39 (1754); Hiern in Journ. Bot. 1899, p. 320 (sensu ampliato); H. et J. Groves in Bab. Man. Brit. Bot. ed. 9, p. 60 (1904);

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* Fl. S. E. United States, ed. 1, p. 419 (1903).
† Fam. Pl. ii. p. 256 (1763).
‡ l.c. 564.
§ l.c. 520.
‖ Fl. Lapp. p. 127 (1812).

Britten et Rendle, List Brit. Seed-plants, p. 6 (1907); Schinz et Thellung in Bull. Herb. Boiss. Sér. 2, vii. p. 402 (1907); Maire et Petitmengin, Mat. Fl. Géogr. Bot. Orient, iv. p. 48 (1908); Hayek, Fl. Steiermark, i. p. 270 (1908); Hand.-Mazz. in Ann. Nat. Hofmus. Wien, xxiii. p. 150 (1909); Briquet, Prodr. Fl. Corse, i. p. 529 (1910); Bornm. in Beih. Bot. Centralbl. xxvii. Abt. 2, p. 318 (1910); Graebner, Syn. Mitteleur. Fl. v. p. 698 (1918), excl. sect. *Psammophilae* (*Rhodalsine*).

Cherleria, Linn. Sp. Pl. ed. 1, p. 425 (1753); Gen. Pl. ed. 5, p. 194 (1754).

Alsine, Linn. Sp. Pl. ed. 2, p. 389 (1762), quoad *A. mucronata*, non Linn. (1753).

Alsine, Gaertn. De Fructibus, ii. p. 223, t. 129, f. 7 (1791); Wahlenb. Fl. Lapp. p. 127 (1812); Fl. Suec. i. p. 290 (1831), excl. species n. 504–6 (*Spergularia* et *Honckenya*); Koch, Syn. ed. 1, p. 111 (1837), excl. spp. 1–4 (*Spergularia* et *Honckenya*); Meisn. Gen. p. 25 (1837); Comment. p. 21; Fenzl in Endl. Gen. p. 964 (1840), excl. sect. *Psammophilae;* et in Ledeb. Fl. Ross. i. p. 341 (1842); A. Gray, Gen. Ill. ii. p. 33, t. 111 (1849); Boiss. Fl. Or. i. p. 669 (1867), excl. series *Rhodalsineae;* Nyman, Consp. p. 116 (1878), excl. *Rhodalsine;* Pax in Engl. et Prantl, Nat. Pflanzenfam. iii. 1 B, p. 82 (1889), excl. *Honckenya* et *Rhodalsine;* Moss in Journ. Bot. 1914, p. 200, excl. *Honckenya;* et in Cambridge Brit. Fl. iii. p. 32 (1920).

Arenaria, sect. *Alsine*, Benth. et Hook. f. Gen. Pl. i. p. 150 (1862).

Leptophyllum, Ehrh. Beitr. iv. p. 147 (1789), sine descr. [based on *Arenaria tenuifolia*, Linn.]

Siebera [Schrad. in Sieb. Fl. Austr. exs. n. 149 (1813)], Hoppe in Flora 1819, p. 24.

Someravera, Hoppe, l.c. 26.

Sabulina, Reichb. Fl. Germ. p. 785 (1832), sensu lato; Nomencl. p. 205 (1841), sensu restricto; Ic. Fl. Germ. v. p. 27 (1841); Fl. Sax. p. 433 (1841); Hayek, Sched. Fl. Stir. Exsicc. p. 7 (1904).

Chetropis, Rafin. Fl. Tellur. iii. p. 80 (1836).*

Alsinanthus, Reichb. Handb. p. 298 (1837).*

Alsinanthe, Reichb. Nomencl. p. 205 (1841); Ic. Fl. Germ. v. p. 29 [*Alsine*, sect, *Alsinanthe*, Fenzl].

Facchinia, Reichb. Nomencl. p. 204, Syn. Red. p. 63 (1841), sub voce "Lanceolatae"; Ic. Fl. Germ. v. p. 29 (1841), descr. [*Alsine* sect. *Lanceolatae*, Fenzl].

Mononeuria, Reichb. Nomencl. p. 205, Syn. Red. p. 118 (1841), sub voce "Uninerviae" [*Alsine*, sect. *Uninerviae*, Fenzl].

Neumayera, Reichb. Nomencl. p. 205, Syn. Red. p. 2 (1841), sub voce "Acutiflorae"; Ic. Fl. Germ. v. p. 30 (1841), descr. [*Alsine*, sect. *Acutiflorae*, Fenzl].

Phlebanthe (sphalm. *Phlebanthia*), Reichb. Nomencl. p. 205, Syn. Red. p. 106 (1841) sub voce "Spergella" [*Alsine*, sect. *Spergella*, Fenzl].

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* Not seen by the writer.

Saginella, Reichb. Nomencl. p. 205 (1841) [*Alsine*, sect. *Saginella*, Fenzl].

Tryphane, Reichb. Nomencl. p. 205 (1841); Ic. Fl. Germ. v. p. 28 [*Alsine*, sect. *Tryphane*, Fenzl].

Wierzbickia, Reichb. Nomencl. p. 205, Syn. Red. p. 106 (1841), sub voce "Spectabiles" [*Alsine*, sect. *Spectabiles*, Fenzl].

Greniera, J. Gay in Ann. Sc. Nat. Sér. 3, iv. p. 27 (1845).

Xeralsine, Fourr. in Ann. Soc. Linn. Lyon, n.s. xvi. p. 347 (1868).*

Alsinopsis, Small, Fl. Southeastern United States, ed. i. p. 419 (1903).

It should be pointed out that the synonymy of *Minuartia* as given above does not include *Rhodalsine*, J. Gay, *Hymenella*, Moçino et Sessé (*Triplateia*, Bartl), and *Honkenya*, Ehrh., which are here regarded as independent genera.

The genus *Mononeuria*, Reichb., seems to have been overlooked by all authors except Post and Kuntze, Lexic. Gen. Phan. p. 373 (1904), who refer it doubtfully to *Arenaria:* it was not included in the Index Kewensis, nor in Dalle Torre et Harms, Genera Siphonogamarum.

Phlebanthe (sphalm. *Phlebanthia*), Reichb. and *Psammanthe*, Reichb., are included in Ind. Kew. and Gen. Siphonog. as doubtful genera of Caryophyllaceae. At first sight No. 7775, *Phlebanthia*, 7776, *Mononeuria* and 7777, *Psammanthe* (Reichb. Nomencl. p. 205) appear to be nomina nuda; but they are defined in the Synonymorum reductio, pp. 106, 118, 94, as synonymous with *Alsine*, sections *Spergella*, Fenzl, *Uninerviae*, Fenzl, and *Psammophilae*, Fenzl, respectively. At that time Endlicher's Genera Plantarum had just been published, and the correspondence of Reichenbach's genera with Fenzl's sections of *Alsine* was more obvious than it is at the present day. A list of Fenzl's sections and Reichenbach's equivalent genera is subjoined.

Endl. Gen. pp. 964-5	**Reichb. Nomencl. pp. 204-5 (1841).**
1. *Sabulineae.*	7768. *Sabulina*, Reichb.
2. *Minuartieae.*	7767. *Minuartia*, Loefl.
3. *Tryphane.*	7769. *Tryphane*, Reichb.
4. *Aretioideae.*	7764. *Siebera*, Schrad.
5. *Lanceolatae.*	7765. *Facchinia*, Reichb.
6. *Acutiflorae.*	7773. *Neumayera*, Reichb.
7. *Spectabiles.*	7772. *Wierzbickia*, Reichb.
8. *Cherleriae.*	7766. *Cherleria*, Hall.
9. *Saginella.*	7770. *Saginella*, Reichb.
10. *Spergella.*	7775. *Phlebanthe*, Reichb.
11. *Alsinanthe.*	7771. *Alsinanthe*, Reichb.
12. *Uninerviae.*	7776. *Mononeuria*, Reichb.
13. *Psammophilae.*	7777. *Psammanthe*, Reichb.

* Not seen by the writer.

It has been shown that the name *Alsine* cannot legitimately be applied to *Minuartia*, Linn. The question now is: should it replace *Stellaria*, Linn., or *Spergularia*, J. et C. Presl, or be relegated to synonymy. A satisfactory answer cannot be given without tracing the history of its application to *Stellaria* and *Spergularia* respectively.

In 1772 *Alsine* was restricted to *A. media*, Linn., by Scopoli;* the two other Linnean species not being represented in his flora. He accordingly included the characters "petala bifida" and "capsula quinquevalvis" in his generic diagnosis. Instead, however, of uniting *Alsine* with *Stellaria*, he retained *Alsine* in Pentandria Trigynia, and placed *Stellaria* in Decandria Digynia. He included in *Stellaria* various species now referred to *Stellaria*, *Moehringia*, *Arenaria*, *Minuartia*, *Spergula*, *Sagina* and *Cerastium!* Evidently no great importance is to be attached to Scopoli's conceptions of the genera of Caryophyllaceae.

Savi, Fl. Pisana, i. p. 323 (1798), and Host, Fl. Austr. i. p. 405 (1827) also restricted *Alsine* to *A. media*, Linn.

The name *Alsine* was first used† as equivalent to *Stellaria* 28 years after the transference‡ of *A. media* to the latter. Stokes employed it in this sense in 1812, but included *Holosteum cordatum*, Linn. (*Drymaria cordata*) in the genus.§

The substitution of *Alsine* for *Stellaria* was so manifestly inconvenient that this application of the name fell into disuse.

In 1893, however, a further attempt was made to replace the name *Stellaria* by *Alsine*, as a result of the adoption of the principle of "priority of place" by the Botanical Club of the American Association for the Advancement of Science. The change was proposed by Britton, as follows:

"*Alsine*, L. Sp. Pl. 272 (1753). I note that this generic name must, on the recognition of priority of place, and the beginning of nomenclature in 1753, clearly displace *Stellaria*, L. Sp. Pl. 421 (1753).

As given in the Species Plantarum, the Linnean *Alsine* is composed of *A. media* (*Stellaria media*, Smith), and *A. segetalis*. now referred to *Tissa*." ‖

The line of argument might be summarised thus: *Alsine media* precedes *A. segetalis* on p. 272 of the Species Plantarum, and is therefore to be regarded as the type of *Alsine*, which accordingly becomes synonymous with *Stellaria*. Of the two generic names, *Alsine* must be adopted, as it occurs on an earlier page.

The substitution of *Alsine* for *Stellaria* has been accepted by a majority of botanists in the United States, including those of the New York Botanical Garden and the United States Department of Agriculture; at the Gray Herbarium, however, *Stellaria*

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* Fl. Carniol. ed. 2, i. p. 224 (1772).

† After 1753. Linnaeus used *Alsine* in the sense of *Stellaria* in 1735 and 1737.

‡ By Cirillo, Char. Comm. p. 36 (1784); and independently by Villars, Hist. Pl. Dauph. iii. p. 615 (1789), and Withering, Arr. Brit. Pl. ed. 3, ii. p. 418 (1796).

§ Bot. Mat. Med. ii. p. 536 (1812).

‖ Bull. Torr. Bot. Club, 1893, xx. p. 277.

is retained in accordance with the International Rules, and Jepson, Flora of Western Middle California, adopts the same attitude. Forty new combinations under *Alsine* have been proposed for North American species of *Stellaria;* and eight new species of *Stellaria* have been published under *Alsine*. Robinson mentions an example of the haste in which the change of nomenclature has proceeded: "the *Alsine Jamesii* of Holzinger, supposed to represent *Stellaria Jamesii*, Torr., in reality rests upon a mixture of the very different *S. oxyphylla* and a luxuriant form of the cosmopolitan *S. media*."*

Some of the more important generic references of *Stellaria* are given below:—

Stellaria, *Linn.* Sp. Pl. ed. 1, p. 421 (1753); Gen. Pl. ed. 5, p. 193 (1754); Cyrill. Char. Comm. p. 36 (1784); Vill. Hist. Pl. Dauph. iii. p. 615 (1789), emend.; Gaertn. De Fructibus, ii. p. 229, t. 130, f. 3 (1791); Endl. Gen. p. 969 (1840); A. Gray, Gen. Ill. ii. p. 37, t. 113 (1849); Benth. et Hook. f. Gen. Pl. i. p. 149 (1862); Boiss. Fl. Or. i. p. 705 (1867); Nyman Consp. p. 111 (1878); Pax in Engl. et Prantl, Nat. Pflanzenfam. iii. 1 B, p. 79 (1889); Robinson in A. Gray, Syn. Fl. N. Am. i. part 1, p. 232 (1897); Robinson et Fernald, Gray's New Man. Bot. p. 381 (1908).

Alsine, Linn. Sp. Pl. ed. 1, p. 272 (1753), pro parte (*A. media*, Linn.); Linn. Gen. ed. 5, p. 132 (1754), pro parte; Scop. Fl. Carniol. ed. 2, i. p. 224 (1772); Stokes, Bot. Mat. Med. ii. p. 536 (1812), excl. *A. rotundifolia;* Britton in Bull. Torr. Bot. Club, 1893, xx. p. 277; et in Mem. Torr. Bot. Club, v. p. 149 (1894); Kuntze, Rev. Gen. iii. p. 12 (1898); Britton, Man. Fl. Northern States & Canada, p. 394 (1907); Britton et Brown, Ill. Fl. ed. 2, ii. p. 41 (1913); Small, Fl. South-eastern United States, ed. 2, p. 421 (1913).

Reichenbach appears to have been the first to restrict *Alsine* to *Spergularia*, in his Flora Germanica Excursoria, p. 566 (1832). He included the following species: *A. segetalis*, L., *A. rubra*, Wahlenb., *A. marina*, Mert. et Koch, and *A. marginata* (DC.). All four species are now referred by most authors to *Spergularia*, but *A. segetalis* is sometimes regarded as the type of an independent genus, *Delia*, Dum.

Reichenbach's action was not followed by his contemporaries: the generic name *Spergularia* was adopted in Endlicher's Genera Plantarum (1840), and in most standard floras published since that date. In 1899, however, Hiern revived the use of *Alsine* for *Spergularia*,† and the name was accepted in the same sense by H. and J. Groves in 1904,‡ and Britten and Rendle in 1907.§ In 1906, however, *Spergularia* was placed on the list of Nomina Conservanda provided for in Article 20 of the International Rules.‖

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* Bot. Gaz. 1898, xxv. p. 166.
† Journ. Bot. 1899, p. 317.
‡ Babington, Man. Brit. Bot. ed. 9, p. 67 (1904).
§ Brit. Mus., List. Brit. Seed-plants, p. 6 (1907).
‖ Act. Congr. Bot. Vienna, 1905, p. 241 (1906).

A selection of the principal generic references of *Spergularia* under that name and *Alsine* is given below. The remaining generic synonyms may be found in Harms et Dalla Torre, Gen. Siphonog. p. 158, and Graebner, Syn. Mitteleur. Fl. v. p. 825 (*Spergularia*) and p. 852 (*Delia*). After *Alsine*, the oldest name for the genus is *Tissa*, Adans. (1763). Schinz and Keller, Fl. Schweiz, ed. 3, p. 204 (1909), restrict *Alsine* to *Delia*, Dum., which they treat as an independent genus.

Spergularia, *J. et C. Presl*, Fl. Cech. p. 94 (1819); Fenzl, in Endl. Gen. p. 962 (1840); et in Ledeb. Fl. Ross. ii. p. 165 (1844); A. Gray, Gen. Ill. ii. p. 27, t. 108 (1849); Benth. et Hook. f. Gen. Pl. i. p. 152 (1862); Rouy. et Fouc. Fl. France, iii. p. 299 (1896); Act. Congr. Bot. Vienna, 1905, p. 241 (1906); Graebner, Syn. Mitteleur. Fl. v. p. 825 (1919).

Arenaria, sect. *Spergularia*, Pers. Syn. i. p. 504 (1805).

Alsine, Linn. Sp. Pl. ed. 1, p. 272 (1753), pro parte (*A. segetalis*, Linn.); Reichb. Fl. Germ. Excurs. p. 566 (1832), emend.; Nomencl. p. 162, n. 6306 (1841); Fl. Sax. pp. 311, 433 (1842); Hiern in Journ. Bot. 1899, p. 317; H. et J. Groves in Babington, Man. Brit. Bot. ed. 9, p. 67 (1904); Britten et Rendle, List Brit. Seed-plants, p. 6 (1907).

The history of *Alsine*, Linn., before 1753, shows that *A. media* was the type of *Alsine*, Linn. (1753-4). *Alsine* was a Tournefortian genus adopted by Linnaeus in 1735.* His description in Gen. Pl. ed. 1, p. 133 (1737) included the characters "petala bipartita," "filamenta decem," "styli tres" and "capsula sexvalvis," and he added the following note: "Quaedam species luxuriat stylis quinque, alia filamenta facillime dejicit, ut vix numerari queant." In the Hortus Cliffortianus, p. 172 (1737), he included in *Alsine* by citation *Stellaria graminea, S. Holostea, S. media, S. nemorum* and *S. aquatica*. *Alsine*, Linn. (1737) was therefore equivalent to *Stellaria*, Linn. as circumscribed at the present day (including *Malachium*). When Linnaeus published his Species Plantarum, ed. 1, however, he broke up this natural genus in strict accordance with his sexual system: he transferred *Alsine media*, which was pentandrous, to Pentandria Trigynia, and retained the generic name *Alsine* for it; and placed *Stellaria aquatica*, which was pentagynous, in Decandria Pentagynia under *Cerastium*. His caryophyllaceous genera of 1753 were in consequence of such changes much less natural than those of 1737.

Linnaeus included a second species under *Alsine* in Sp. Pl. ed. 1: this was *A. segetalis*, a species which had not appeared previously in any of his works. It can hardly be maintained that this was the type of *Alsine*, Linn. (1753), rather than *A. media*, which was included in *Alsine*, Linn. (1737).†

The generic description of *Alsine* in Gen. Pl. ed. 5 is equally applicable (or inapplicable) to the two species. It was designed to cover both, as is evident from the omission of the number of

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* Syst. Nat. ed. 1, Decandria Trigynia (1735).

† *Alsine media* appears to have been generally regarded as the type of *Alsine* for more than 50 years after 1753—*see* Pers. Syn. i. p. 330 (1805), and Guillemin in Dict. Class. Hist. Nat. xi. p. 205 (1827).

capsule-valves; and the description of the petals as longer than the sepals fits neither.

On historical grounds, then, the application of the name *Alsine* to *Spergularia* (or *Delia*) is inadmissible; and *Alsine*, Linn. may be regarded as synonymous with *Stellaria*, Linn. If 1737 were taken as the starting point of botanical nomenclature, *Alsine* would supersede *Stellaria*, but under the International Rules and the American Code the nomenclature of vascular plants begins in 1753.

The arguments for the retention of *Stellaria* may be stated as follows:

1. The description of *Stellaria* in Gen. Pl. ed. 5, (1754), is more accurate and complete than that of Alsine: it includes the important characters "petala bipartita" and "capsula sexvalvis." The description of *Alsine*, on the other hand, is vague, covering the common characters of two discordant elements, and it is inaccurate as regards the relative length of sepals and petals; the number of capsule valves is not mentioned.

2. Eight species were comprised in *Stellaria* in Sp. Pl. ed. 1, pp. 421, 1196, *five* of which are still recognised as belonging to the genus, namely, *S. nemorum, dichotoma, radians, Holostea* and *graminea*. *S. cerastoides* (*Cerastium trigynum*) was included because it had only 3 styles; and *S. biflora* (*Minuartia biflora*) and *S. Arenaria* (*Arenaria spathulata*) because their petals were emarginate. *Alsine* comprised two species, *one* of which was a *Stellaria*.

3. The five species under *Stellaria* are *typical*, whereas the single species under *Alsine* (*S. media*) is *aberrant*, the androecium having become reduced in correlation with the more frequent occurrence of autogamy.

4. There is no ambiguity about the name *Stellaria*,* whereas *Alsine* has been used for three different genera.

5. The first author who united *Alsine* with *Stellaria* chose the latter generic name.†

6. The name *Stellaria* has been in general use for the genus from 1753 down to the present day. *Alsine* has been used since 1893 in place of *Stellaria*, by the adherents of the American Code of Nomenclature, and by Otto Kuntze.

The fact that the name *Alsine* is more ancient than *Stellaria* cannot be adduced in favour of retaining the former by those who recognise 1753 as the starting point of botanical nomenclature. Linnaeus replaced *Alsine*, Tourn. by *Stellaria*, Linn., and quoted the former as a synonym.‡ He made a new genus *Alsine*, Linn. for the reception of two pentandrous Alsineae. The fact that one of these (*A. media*) is now recognised as belonging to *Stellaria* does not justify the revival of a Tournefortian name which Linnaeus deliberately rejected in favour of one of his own invention.

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* *Stellaria*, Kuntze, is *Callitriche*, Linn., but the name has not been taken up by other botanists.

† Cyrill. Char. Comm. p. 36 (1784).

‡ Gen. Pl. ed. 5, p. 193 (1754).

Under Article 46 of the International Rules,* *Stellaria*, Linn. has precedence over *Alsine*, Linn., because the name *Stellaria* was chosen by Cirillo who was the first to unite the two genera.

Under Canon 13 of the American Code,† *Alsine* has precedence over *Stellaria* because it appeared on an earlier page of the same work.

The International Rules leave the choice of two generic names of the same date to the judgment of the first botanist who united the genera. The American Code makes it dependent on "priority of place," a principle which is not recognised as valid by a majority of botanists.

As regards species which are united there is some small logical basis for "priority of place": as a rule a species adequately known to the author will precede one which is imperfectly known. But as regards genera the case is different: they are commonly arranged according to some system of classification: and "priority of place" applied to the Species Plantarum simply means that a generic name in Pentandria, for example, has precedence over one in Decandria, whatever the arguments in favour of the latter.

In view of these considerations it is to be hoped that the question of "priority of place" may be reconsidered by the American Permanent Committee on Nomenclature.

On the other hand, Article 36 of the International Rules prescribing a Latin diagnosis for new groups might be re-considered at the next International Congress. The way would then be prepared for a world-wide agreement on nomenclature.

Summary.

1. The history of the name *Alsine* and its application to *Stellaria*, *Spergularia* and *Minuartia* has been traced.

2. The type of *Alsine*, Linn. (1753) is *A. media*, Linn.

3. *Alsine*, Linn., thus becomes synonymous with *Stellaria*, Linn. The latter name should be adopted under the International Rules. Under the American Code, however, the former name is adopted in accordance with the principle of "priority of place," in spite of six strong arguments in favour of *Stellaria*. This suggests that "priority of place" as regards genera should be abandoned, as leading to undesirable results.

4. *Alsine*, Linn. emend. Gaertn. (1791) should be replaced by *Minuartia*, Linn. (1753).

5. *Alsine*, Linn. emend. Reichb. (1832) should be replaced by *Spergularia*, J. et C. Presl (a nomen conservandum under the International Rules).

6. The name *Alsine* thus disappears altogether. This is a distinct advantage, as it has been applied to three different genera and is now quite ambiguous.

* When two or three groups of the same nature are united the name of the oldest is retained. If the names are of the same date the author chooses, and his choice cannot be modified by subsequent authors.

† Of names published in the same work and at the same time, those having precedence of position are to be regarded as having priority. Examples—*Alsine*, L. Sp. Pl. 272, is to be regarded as having priority over *Stellaria*, L. Sp. Pl. 421.

LI.—MISCELLANEOUS NOTE.

John Gilbert Baker.—By the death of Dr. J. G. Baker, F.R.S., on August 10th, 1920, Kew mourns the loss of one who for nearly 33 years gave of his best to the promotion and encouragement of the botanical work of the Royal Botanic Gardens.

Born on January 13th, 1834, at Guisboro', Yorkshire, he early devoted himself to botanical studies, and on April 1st, 1866, was appointed Assistant to the Librarian at Kew. In 1884 he was promoted to the position of Principal Assistant in the Herbarium and Library, and in 1890 succeeded to the office of Keeper of the Herbarium and Library on the retirement of the late Prof. D. Oliver. He retired from this office on January 12th, 1899, after having completed 32 years and 10 months of devoted and self-sacrificing public service.

His contributions to botanical science were numerous and valuable, but it is rather as the kindly, helpful and appreciative friend that his memory lives with us a treasured possession. Combined with the charm of his character, his keen sense of honour and love of beauty in poetry, art and nature will long be remembered.

He was an able teacher, and his lectures to the young gardeners at Kew were a source of delight to himself and a keen stimulus to his classes of students.

Sir William Thiselton-Dyer, in a letter to a friend after his death, writes:—"I always felt for him an affectionate regard. He was helpful to me in my early years, and a faithful support to me at Kew. He was one of the best of men. In his serene disposition he was at peace with God and man. His life was one of cheerful devotion to useful and conscientious work, and in it he leaves behind him a worthy monument. To those who knew him his memory will always be fragrant."

Dr. Baker's contributions to botanical literature were very numerous. About 400 papers appear under his name in the Royal Society's Catalogue of Scientific Papers. This catalogue and the lists of publications by the members of the Kew staff, printed in the *Kew Bulletin*, 1897, pp. 1–84, 238–240, and 1907, Appendix V., form an almost complete bibliography of his botanical work. He assisted Miss Willmott in her monograph of Rosa (1910–14), being "of especial service in drawing up the specific characters." The following are additions to the lists mentioned above:—

Description of the new species and principal varieties of Lily discovered since the publication of the monograph of Elwes (1880). (Journ. R. Hort. Soc. xxvi. pp. 335–345, with figs. 175–179; 1901.)

Biographical notes on the early botanists of Northumberland and Durham. (Nat. Hist. Trans. Northumberl., Durh., etc., xiv. pp. 69–86; 1902.)

[Biographical memoir of A. W. Bennett.] (Journ. R. Microsc. Soc. 1902, pp. 155–157, with portrait.)

Fritillaria askhabadensis. (Gard. Chron. 1902, xxxi. pp. 237–238, with fig.)

Lycoris Sprengeri, Comes. (Gard. Chron. 1902, xxxii. p. 469, with plate.)

François Crépin [obituary notice]. (Proc. Linn. Soc. cxv. pp. 28–30; 1903.)

Beiträge zur Kenntnis der afrikanischen Flora, herausg. von Hans Schinz; Liliaceae, Amaryllidaceae, Velloziaceae. (Bull. Herb. Boiss. 2e sér. iii. pp. 663–668; 1903.)

The genus Albuca in the Herbarium of the Albany Museum, Grahamstown. (Rec. Albany Mus., i. pp. 89–94; 1904.)

A revised classification of Roses, 1905. (Journ. Linn. Soc. xxxvii. pp. 70–79; 1905.)

North Yorkshire: studies of its botany, geology, climate and physical geography. Ed. 2, pp. xviii. + 671 and 3 maps. London, 1906. (Trans. Yorks. Bot. Union; Bot. Ser., vol. iii.)

Raspberries and brambles. (Gard. Chron. 1907, xli. pp. 33–34.)

Botany [of Yorkshire] (Victoria History of the County of York, pp. 111–172, with map. London, 1907.)

Euphrasias of North-East Yorkshire. (Naturalist, 1909, p. 79.)

Thymus ovatus in North Yorkshire. (Naturalist, 1909, p. 371.)

Thiselton-Dyer, Flora of Tropical Africa, vol. vi. Sect. 1. Nyctagineae, Illecebraceae, Phytolaccaceae, Polygonaceae, Podostemaceae, Cytinaceae, Piperaceae and Monimiaceae, with additions by C. H. Wright (pp. 1–14, 94–134, 143–1556, 167–171; 1909).

Amarantaceae and Chenopodiaceae, with C. B. Clarke (pp. 14–94; 1909).

Aristolochiaceae, with C. H. Wright (pp. 134–143; 1909).

Proteaceae, with C. H. Wright (pp. 193–211; 1910).

Santalaceae, with A. W. Hill (pp. 411–434; 1911).

Freesia Armstrongii.(Gard. Chron. 1910, xlvii. p. 169.)

New plant localities in North-East Yorkshire. (Naturalist, 1911, p. 309.)

The botany of Burnham Beeches. (Journ. Bot. 1917, pp. 276–278.)

William Foggitt. [Obituary notice.] (Journ. Bot. 1917, p. 200.)

On botany and physical geography of the Holy Land. (Gard. Chron. 1917, lxii. pp. 245–247, 260, with figs. 93–96.)

Matthew B. Slater. [Obituary notice.] (Journ. Bot. 1918, p. 191.)

He was buried on August 19th in the Friends' Burial Ground at Isleworth, and the staff at Kew—many of whom were present—sent as a tribute of their affection a wreath composed entirely of monocotyledonous flowers which had formed some of the principal subjects of Dr. Baker's botanical researches.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10] [1920

LII.—A WILT OF CARNATIONS, NIGELLA, DELPHINIUM AND COSMOS, WITH A NOTE ON SCLEROTIUM ROLFSII.

W. Small.

In May, 1919, carnation plants in a garden near Kampala, Uganda, were observed to be dying by stages. The plants wilted gradually, paling of the lower leaves being succeeded by the collapse of the whole plant. The outer tissues of the underground parts of the stems of affected plants separated readily from the wood, and an easy pull from the ground broke off the plants. This disintegration of the tissues just under the soil surface was marked by a blackened sunken soft area, longitudinally arranged, and evidently a characteristic symptom of the disease. It was found to be of regular occurrence.

Histological examination of the wood immediately under the discoloured area, which was invariably stained a dark colour, showed it to be permeated with mycelium. This internal mycelium varied in thickness, was much branched, and was seen to pass freely from tracheids to parenchyma without constrictions. The main hyphae in a tracheid would give off numerous slender branches which could be followed as they penetrated the pits. In only one dead plant a second mycelium, which will be referred to later, was found between wood and bast. It was remarkable for the numbers of crystals occurring along its course. This second mycelium was found also externally on the diseased crown of the plant, and, in this position, it was accompanied by sclerotia as well as by crystals, and determined as *Sclerotium Rolfsii*, Sacc.

On the dead leaves of wilted plants were found a species of *Periconia* and a *Macrosporium* which resembled *M. nobile*, Vize, figured by Massee on p. 504 of his "Diseases of Cultivated Plants

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and Trees" (1910). It may be significant, in view of what follows, that Massee's set of figures of the *Macrosporium* includes a drawing of three *Fusarium* spores found, according to the text, "mixed with, but no proof of relationship with, the *Macrosporium*." As far as can be judged from the figure, these *Fusarium* spores resemble those subsequently referred to in this paper, and also those figured by Dr. Van der Bijl in his account of a South African wilt of carnations.* The Uganda wilt under discussion is undoubtedly similar in all respects to that described by Van der Bijl, and it is unnecessary, in view of the previous publication of his paper, to go into full details.

ISOLATION OF THE FUNGUS.

In attempts to show whether the Uganda wilt was the same as that of South Africa or to discover another cause for it, if such existed, small pieces of tissue were cut with sterile instruments from the underground diseased areas of wilted carnations, already described, and, after sterilisation in mercuric chloride (1 : 1000) or flaming in alcohol, were shaken up in tubes of solid media and poured into petri-dishes. The solid media consisted of $2\frac{1}{2}$ per cent. carnation-, prune-, or sugar-cane-agar.

Mycelial growth took place at laboratory temperature after the lapse of twelve hours, and microconidial formation was very vigorous after three days. After fourteen days the conidia were three-, and, later, multi-septate and of a *Fusarium* type. Chlamydospores were produced in abundance both terminally and intercalarly. The aerial mycelium, at first faintly pink in the mass, became after twelve days of a deep pink colour.

FIG. 1.—Mycelium, conidia and conidiophores of *Fusarium* sp. from Carnation, in pure culture, 36 hours, × 500.

Subcultures were subsequently made on banana plugs and prune-agar slants, and the latter were used in inoculation experiments. The colour of the banana-plug mycelium was at first

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* Van der Bijl: "Wilt" or "Crown Rot" Disease of Carnations caused by *Fusarium* sp.—Annals Appd. Biology, II., 267, 1915–16.

faintly grey, and afterwards pink, while that of the prune-agar mycelium was a very faint yellow succeeded by a pink. Chlamydospores appeared in these cultures in six days. The fungus was also grown from microconidia placed in sterile distilled water. In this case the mycelium assumed a rosy-pink colour which became almost dark-red. It was many-septate, globuled and apparently brittle, and numerous conidia and chlamydospores were developed.

At the same time whole diseased carnation plants were carefully sterilised and afterwards placed in damp chambers; these were found to develop upon and in the neighbourhood of the sunken area of the crown aerial mycelium of a white-pink colour accompanied by conidia after the lapse of twelve days. This mycelium and the conidia were indistinguishable from those obtained from the cultures mentioned above, and from those found in further cultures derived from them by transferring mycelium and conidia directly into tubes and plates.

ISOLATION OF THE FUNGUS FROM WILTED NIGELLA AND DELPHINIUM.

A few days after the receipt of the wilted carnation material, dying plants of love-in-a-mist (*Nigella*) and larkspur (*Delphinium*) were found in the same bed of the same garden which afforded the examples of carnation wilt, and, after a further few days, a dying plant of *Cosmos* (*bipinnatus?*) was similarly collected.

All these were found to show the same macro-symptoms as the wilted carnations, and, histologically, to be attacked and permeated in the same parts by mycelium similar to that found in the carnation material. On the exterior of two of the *Delphinium* tap-roots were found mycelium, conidia, and chlamydospores which were shown to be identical with material of cultures derived from the *Delphinium* plants. No mycelium or sclerotia of *Sclerotium Rolfsii* were found on either the *Nigella*, *Delphinium* or *Cosmos* material.

Whole plants of *Nigella* and *Delphinium* were sterilised by immersion for ten minutes in mercuric chloride solution (1 : 1000), and small pieces of tissue from the blackened areas near the crowns were cut out under sterile conditions and placed in prune-agar plates. The remains of the plants were put into damp-chambers. In all of these, both *Nigella* and *Delphinium* plants, plentiful mycelial growth occurred on collars and tap-roots after the lapse of thirty-six hours, and after a further twelve hours *Fusarium* microconidia were in abundance. The conidia were one- or three-septate and varied in length form 10 to 20 μ, the more elongated being comparatively narrower than the shorter forms. The mycelium was white and flocculent. Sets of banana-plugs were subsequently inoculated with microconidia from both host plants. Growth was comparatively slow, for no aerial mycelium was visible until three days had elapsed and no conidia were found until twelve days later. These conidia were small, and successive crops of them did not attain the size of those used to inoculate the banana plugs until after twenty-four days. The

mycelium in both sets of cultures was latterly of a dark-grey colour with a faint pink tinge in parts.

FIG. 2.—Conidia from pure culture of *Fusarium* sp. from *Nigella*, × 500.
FIG. 3.—Microconidia and a chlamydospore from same culture as 2, × 500.

The tissue fragments of both *Nigella* and *Delphinium* in prune-agar gave rise overnight to aerial mycelium which was white, flocculent, septate, branched, finely-granular, and of an average thickness of 5 μ. Growth continued vigorously, and after four days microconidia were very numerous. These were succeeded by macroconidia and chlamydospores after a further twenty-four hours.

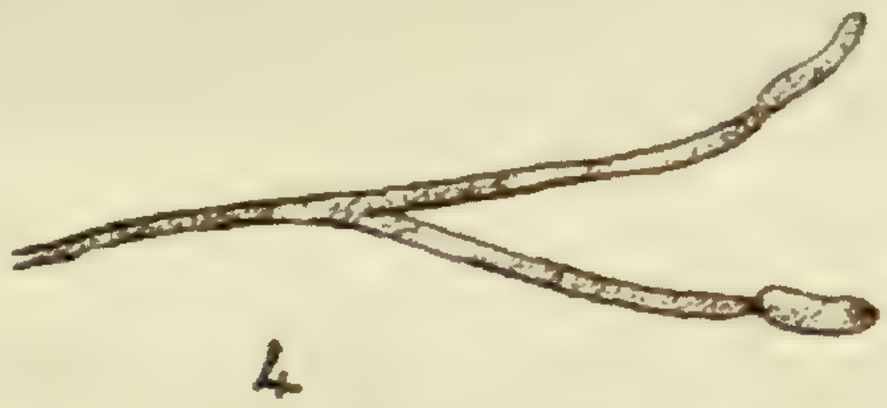

FIG. 4.—Formation of terminal conidia in same culture as 2 and 3, × 500.
FIG. 5.—Conidia of *Fusarium* sp. from *Delphinium*, × 500.

The *Cosmos* material was rather scanty, and it was unfortunately impossible to isolate from it pure strains of the fungus at work. But it should be noted that a *Fusarium* was found externally upon it, and that the conidia and chlamydospores of this *Fusarium* were identical with those found on the *Nigella* and *Delphinium* material. It could not but be observed that there was a striking resemblance between the species of *Fusarium* isolated from the carnation, *Nigella* and *Delphinium* plants, and there seemed to be good ground for the conclusion that the fungus at work was the same in all three cases. As it was desirable to study more closely than had been done the differences between

the strains from the different hosts, further cultures were made by inoculating sugar-cane-agar slants with conidia derived in each case from the original tissue fragments in petri-dishes. These cultures were kept under exactly similar conditions.

Mycelial growth was visible in all in forty-eight hours, and after seventy-two hours the surfaces of all the slants were covered with flocculent mycelium bearing numerous microconidia. The then prevailing colour of the carnation culture mycelium was white to pale-yellow; of the *Nigella*, honey-yellow, and of the *Delphinium*, faint pink. After six days the *Nigella* and *Delphinium* cultures showed numerous conidia measuring up to 40 by 7 μ and becoming three- to five- and multi-septate. Chlamydospore-formation took place in all three strains on the seventh day. It was remarked that the *Nigella* and *Delphinium* strains of the *Fusarium* were alike in respect of the time-development of conidia though not in respect of the numbers of conidia. The carnation strain, again, lagged behind in the production of macroconidia, but its microconidia were always far more plentiful than those of the other strains. After sixteen days the carnation slants were producing very numerous microconidia and only a few macroconidia. The latter measured up to 30 by 3 μ, and were commonly only three-septate. They were thus smaller than the same conidia of the other strains. The many-septate condition was fairly scarce, and the chlamydospores measured up to 8 μ in diameter.

Of the three strains when judged from the standpoint of the vigour of conidial production and the sizes of the mature conidia at equal ages, that derived from the *Nigella* material was the most vigorous, and that from the carnation material the least so. Judged by the same standards, the fungus from the *Delphinium* material tended towards an intermediate position between the *Nigella* and carnation strains. In other words, the physiological expressions of the three strains varied slightly, and this variation was accompanied by slight morphological differences. As a consequence, the results of the cross-inoculation experiments which were instituted were anticipated with interest.

INFECTION EXPERIMENTS.

Series of plants were grown in large tins in soil which had been treated in the autoclave at 115° C. for an hour. Imported seeds and cuttings from wilt-free plants were used, and control pots were kept in each case. The inoculum employed consisted of small pieces of agar with conidia and mycelium of the fungus, and the viability of the mycelium and spores was tested in hanging-drops of sterile distilled water.

The first series of experiments consisted of the direct inoculation of the *Fusarium* from carnation, *Nigella* and *Delphinium* cultures into the soil of tins containing respectively carnation, *Nigella* and *Delphinium* plants. The inoculum was treated in two ways (1) by being placed from $\frac{1}{2}$ in. to 1 in. below the surface of the soil in close proximity to the growing plants, and (2) by being placed against wounds made in the plants by cutting or scratching with a sterile scalpel from $\frac{1}{2}$ in.

to 1 in. below the soil surface. After the inoculations and wounding of the control plants when necessary, all the tins were kept in one place out of doors. During the ensuing period when the plants were under observation, the rainfall amounted to 6·79 in. distributed very evenly over forty days.

The *Nigella* plants, both wounded and unwounded, were the first to show signs of disease; the typical sickly appearance was noticed after six days. Complete collapse of the first diseased plants took place after twenty days. Meanwhile, the carnations and *Delphiniums* began to wilt, the periods between first signs of disease and death ranging from fifteen to eighteen days. All the inoculated plants of all three species were dead in thirty days. No difference could be detected between the behaviour of wounded and that of unwounded plants. Removal of dead plants from the soil disclosed the usual softened area, and the *Fusarium* sp. was isolated (by the tissue-fragment method) from all except one carnation plant. All the controls remained healthy.

While these experiments were in progress a series of cross-inoculations was undertaken. Sets of six tins each of plants of carnations, *Nigella* and *Delphinium*, were inoculated in the two ways already mentioned, each set of three with material from cultures from all three host-plants. In this way carnations were inoculated with the fungus from carnation, *Nigella* and *Delphinium; Nigella* plants were inoculated with the fungus from *Nigella*, *Delphinium* and carnation; and *Delphinium* with the fungus from *Delphinium*, carnation and *Nigella*. The plants in all the tins were slightly thinned out, a clear line was made across the middle of each tin, and the plants of one-half were set aside as controls. At the same time, six lots of *Cosmos* plants were treated similarly and inoculated with the *Fusarium* from carnation, *Nigella* and *Delphinium*.

The results of these cross-inoculation experiments were remarkably consistent. All the sets of inoculated plants, including those of *Cosmos*, contracted the wilt disease and succumbed to it; the time elapsing between the observation of first signs of sickness and death varied from nineteen to thirty-one days. Again, no difference was noted between wounded and unwounded plants, and again the *Fusarium* sp. was recovered from wilted plants by the tissue-fragment method. It could not be said that there were any really distinct signs of greater pathogenicity in one strain than in the others, though such signs were looked for, but on the other hand, it seemed clear in a few cases that the recovered *Fusarium* was of the *Nigella* or *Delphinium* type rather than the carnation type, or vice-versa. For example, certain plants of *Nigella* inoculated with the carnation strain gave, on recovery of the fungus, the distinct carnation type of *Fusarium* with the very numerous microconidia and the slowly-developing macroconidia, and several plants of *Cosmos* inoculated with the *Nigella* strain gave, in the same way, the *Nigella* type with its early-maturing large-sized macroconidia. Unfortunately, pressure of routine and other work prevented this point from being followed up, as it also prevented the question of combating the *Fusarium* with soil

fungicides from being undertaken. It seems clear, however, that, whatever morphological and physiological differences may exist between the different strains, the results of the cross-inoculation experiments lend themselves to the one interpretation, viz., that the species of *Fusarium* under investigation is the cause of a wilt of carnations, *Nigella*, *Delphinium* and *Cosmos*.

The control plants of the cross-inoculation experiments were kept under observation for some time, and it was noted that the majority remained healthy for a further period of four months. Several of the carnation plants adopted a rosette-like habit of growth, but it was not determined if this was due to the *Fusarium*.

Control measures.

Neither quicklime nor formalin was available and could not be tried. The bed which originally yielded the examples of wilted carnations, *Delphinium*, *Nigella* and *Cosmos* was treated with a solution of carbolic acid (1 oz. to 1 gallon of water), at the rate of 1 gallon of solution to every four or five square feet. The treatment was not successful, for replanted carnations, etc., were attacked and killed by the *Fusarium*. Subsequently, a proprietary soil-fungicide (Fungal) was dug into the diseased soil in small quantities, roughly at the rate of two or three ounces to a cubic foot of soil. Results are not available, but it is felt that an extended use of Fungal might prove successful. Again, the addition of a drop of 10 per cent. Izal to 25 c.c. of solid medium prevented growth of the *Fusarium* in culture. This disinfectant, therefore, might be usefully employed, but, as has been indicated, it was not possible at the time to experiment fully. A satisfactory method of freeing soil from parasitic fungi with a material at once cheap and easily handled has yet to be discovered, and it is now generally recognised that help may be profitably sought oftener along the lines of selection and breeding of resistant or immune varieties than along those which lead to the use of chemical fungicides.

Note on *Sclerotium Rolfsii*, Sacc.

The occurrence of mycelium and sclerotia of *Sclerotium Rolfsii*, Sacc. on a single wilted carnation plant has already been noted. The mycelium was white in colour and the crystals associated with it were found to dissolve in strong hydrochloric acid. Further investigation showed it to have penetrated the woody tissues of its host along with *Fusarium* mycelium, but it was always distinguishable from the latter by the presence of the crystals which are presumably characteristic of *Sclerotium Rolfsii*.

Pure cultures of this fungus were easily prepared by transferring sclerotia to decoctions of sugar-cane in petri-dishes. Mycelial growth and the formation of sclerotia were very rapid, the whole dish becoming within a few days a strong felted mass of hyphae dotted with sclerotia in various stages of development. The sclerotia in culture and in nature are more or less spherical, but may be ovoid; they change colour during growth from pale to dark-brown, and they resemble mustard seed in size. The

mycelium of the cultures was aerial, white, flocculent, septate, with numerous crystals, and, in arising from a sclerotium, it "flowed," as it were, in aggregated and twisted strings which originated at definite points.

In sclerotial-formation, masses of hyphae stand erect from the substratum of mycelium. They are dumb-bell-shaped in the earliest stages. Gradually, the free end of the mass rounds itself off, becomes more compact, and changes colour from an intense white to a pale brown. When it is fully mature, the sclerotium is easily detached. The point of attachment is often marked by a dimple, and it may be darker in colour than the body of the sclerotium. During growth the sclerotia are covered with droplets of moisture. Occasionally the hyphal mass will form a twin sclerotium which is then dumb-bell-shaped. The core of a sclerotium consists of a densely-woven mass of hyphae, while the covering strands forming the exterior are arranged in one direction. The latter may be slightly ragged, but the sclerotium is, as a rule, perfectly smooth. In one culture which was contaminated with a green mould, the growth of mycelium was sufficiently profuse and rapid to smother and eventually to overwhelm the mould.

In sterile distilled water the growth of mycelium from a sclerotium was very sparse, and no new sclerotia were formed in the space of three months. Similarly, sclerotia placed in sterilised soil moistened with sterile distilled water gave rise to mycelia which were comparatively weak in amount, but strong enough in growth to attach themselves to small stones. Growth, however, ceased altogether in twenty days. Young pale-brown sclerotia could not be induced to push out mycelial strands. No conidial stage was found in any of the cultures.

A few infection experiments were conducted with *Sclerotium Rolfsii* by placing sclerotia and mycelia from a culture amongst soil in which were growing carnations, *Nigella*, *Delphinium* and *Cosmos*. No results were apparent, although the plants were kept for several months. Subsequent exhumation of the sclerotia proved that no mycelial growths had taken place. The fungus may have occurred as a saprophyte only, and its scarcity may have been accounted for by its lack of means of dissemination; but, again, a soil-moisture stimulus was evidently not sufficient to provoke development, and the infection sclerotia were not placed in contact with the plants. Mature sclerotia placed in small quantities of prune decoction in watch-glasses, usually filled the watch-glasses with a growth of mycelium in twenty-four hours, but similar sclerotia when treated first by immersion in a solution of Izal (1 : 100) or carbolic acid (1 oz. to 1 gall. water), for five minutes, and afterwards placed in prune decoction, showed no growth at all. The effect of Fungal, tested by immersing sclerotia for twelve hours in open jars of soil containing the fungicide, was similar, viz., total inhibition of growth.

This record of *Sclerotium Rolfsii* is the only one for Uganda, and no allied form has yet been found on any other plant.

LIII.—DIAGNOSES AFRICANAE: LXXIV.

1651. **Bolusia rhodesiana,** *Corbishley* [Papilionaceae-Galegeae]; affinis *B. amboensi,* Harms (*Phaseolo amboensi,* Schinz), sed innovationibus leviter pubescentibus, foliolis plerumque angustioribus longioribusque, petiolulis basi conspicue pubescentibus, calycis lobis (praesertim fructiferis) multo longioribus differt.

Herba perennis, e basi ramosa, 0·3–0·75 m. longa, leviter pubescens, lignosa. *Folia* digitatim 3-foliolata, linearia, glanduloso-punctata, foliolis basi cuneatis sessilibus apice minute mucronulatis ad 2·5 cm. longis, 0·5–1 cm. latis, lateralibus multo brevioribus, costa infra pubescente; petioli usque ad 1 cm. longi, adpresse pilosi; stipulae foliaceae, oblique cordatae, erectae, glanduloso-punctatae, 7 mm. longae, 5 mm. latae. *Flores* pauci; rachis terminalis vel folio opposita; pedicelli leviter pilosi, 5 mm. longi; bracteae circiter 4 mm. longae, ciliatae, bracteolis brevioribus linearibus. *Calyx* 0·8–1 cm. longus, lobis patentibus circiter 0·6 cm. longis. *Vexillum* glabrum, striatum; alae circiter 8 mm. longae; carina spiraliter contorta, resoluta usque ad 5 cm. longa, nitido-aurea. *Genitalia* inclusa, contorta. *Legumen* turgidum, 3 cm. longum, rostratum, glabrum. *Semina* multa, immatura reniformia, compressa, 3 mm. lata, funiculo 1·5 mm. longo.

Tropical Africa. Southern Rhodesia, without definite locality (probably Rusape), *Hislop* 26.

1652. **Mairea feliciodes,** *Hutchinson et Corbishley* [Compositae-Asteroideae]; affinis *M. lasiocarpae,* DC., sed foliis oppositis multo latioribus (nec subteretibus), capitulis majoribus, achaeniis breviter pubescentibus differt.

Suffrutex ramosus; rami vetustiores teretes, cinerascentes, circiter 3 mm. diametro; ramuli hornotini laxe foliati, adpresse strigoso-pilosi. *Folia* opposita, sessilia, oblongo-lanceolata, basi attenuata, apice subobtusa et recurvata, usque ad 2 cm. longa, 3–5 mm. lata, coriacea, setoso-pilosa. *Capitula* terminalia, longe pedunculata, usque ad 5 cm. expansa; pedunculus nudus, breviter pubescens, circiter 7 cm. longus. *Involucri bracteae* subuniseriatae, oblongo-lanceolatae, acutae, 8–9 mm. longae, extra strigosae, intra nitidae, marginibus membranaceis. *Flores radii* numerosi; corollae tubus angustus, 3 mm. longus, minute puberulus; lamina circiter 2 cm. longa, apice minute trifida; styli rami filiformes, 3 mm. longi. *Flores disci:* corollae tubus basi constrictus, 7 mm. longus, basin versus leviter puberulus; lobi anguste triangulares, acuti. *Achaenia* compressa, elliptica, 2·5 mm. longa, breviter pubescentia. *Pappi* setae corollae tubo longiores, plumosae, pallide stramineae.

South Africa. Griqualand West: Asbestos Mts., 1200 m., July 1894, *R. Marloth* 2018 (type); Colesberg, near the Orange River, *W. Knobel* (without number).

A very distinct species on account of the opposite leaves, which are exceptional in the genus.

1653. **Mimusops Macaulayae,** *Hutchinson et Corbishley* [Sapotaceae-Mimusopeae]; affinis *M. umbraculigerae,* nobis,

FIG. A.—*Mimusops Macaulayae*, nobis:—1, flowering branch; 2, corolla segment and its two lateral appendages and stamen from within; 3, the same from outside; 4. stamen from outside; 5, staminode; 6, pistil. B.—*Mimusops spiculosa*, nobis:—1, corolla segment and its two lateral appendages and stamen from within; 2, the same from outside; 3, stamen from outside; 4, staminode; 5, pistil. C.—*Mimusops umbraculigera*, nobis:—1, corolla segment and its two lateral appendages from within; 2, the same from outside; 3, stamen from outside; 4, staminode; 5, pistil:—A1 slightly reduced; remainder enlarged.

sed foliis infra lanato-pubescentibus, pedicellis longioribus, petalis apice integris, staminodiis profunde bilobis differt.

Ramuli biformes, elongati, efoliati, abbreviati brevissimi, apice dense foliati et floriferi. *Folia* oblongo-elliptica, apice emarginata, basi obtusa, 2·5–4 cm. longa, 1·3–2 cm. lata, coriacea, supra laxe pubescentia, infra lanato-tomentosa, nervis lateralibus inconspicuis; petioli 5–6 mm. longi, tomentosi. *Flores* infra folia dense aggregati, pedicellis ex axillis foliorum delapsorum ortis recurvatis circiter 8 mm. longis tomentosis. *Sepala* videntur 3 + 3, ovato-elliptica, circiter 4 mm. longa et 2 mm. lata, exteriora pubescentia. *Corollae segmenta* sepalis isomera, oblongo-lanceolata, apice obtusa, marginibus undulatis, 3 mm. longa, 1 mm. lata, appendicibus lateralibus oblongis fere aequilongis. *Stamina* petalis isomera et opposita; filamenta filiformia, circiter 2 mm. longa; antherae 2·5 mm. longae; staminodia plana, oblonga, apice profunde biloba, lobis triangularibus vel linearibus. *Pistillum* 4 mm. longum, ovario ovoideo-globoso breviter pubescente in stylum glabrum lineare abrupte contracto.

Tropical Africa. Northern Rhodesia, Mumbwa, *Mrs. Macaulay* 1002.

1654. **Mimusops spiculosa**, *Hutchinson et Corbishley* [Sapotaceae-Mimusopeae]; affinis *M. Mochisia*, Baker, sed foliis pubescentibus minoribus, pedicellis et antheris brevioribus, staminodiis filamenta similibus differt.

Frutex divaricatus, ramulis biformibus rugosis glabris. *Folia* ad apices ramulorum brevissimorum dense aggregata, oblanceolata, apice emarginata, basi breviter angustata, immatura 2–3 cm. longa, 0·8–1·2 cm. lata, tenuiter chartacea, discoloria, utrinque lanato-pilosa, nervis lateralibus inconspicuis; petioli circiter 4 mm. longi, tomentosi. *Flores* infra folia dense aggregati, pedicellis ex axillis foliorum delapsorum ortis recurvatis circiter 6 mm. longis adpresse pubescentibus. *Sepala* 3 + 3 vel 4 + 4, ovato-elliptica, circiter 4 mm. longa et 2 mm. lata, extra pubescentia. *Corollae segmenta* sepalis isomera, oblongo-elliptica, integra, apice rotundata, 3 mm. longa, 1 mm. lata, appendicibus lateralibus 2 paullo minoribus. *Stamina* petalis isomera et opposita; filamenta spiculiformia, 1·5 mm. longa; antherae crassae, 2 mm. longae; staminodia filamentis similia sed paullo breviora. *Pistillum* 3 mm. longum, ovario pubescente in stylum glabrum sensim attenuato.

Tropical Africa. Rhodesia: Victoria Falls; spreading shrub on cliffs round Gorge, November 1905, *C. E. F. Allen* 185.

1655. **Mimusops umbraculigera**, *Hutchinson et Corbishley* [Sapotaceae-Mimusopeae]; affinis *M. densiflorae*, Engl., sed foliis utrinque pubescentibus, staminodiis irregulariter dentatis differt.

Ramuli subverticillati, cortice verruculoso cinereo obtecti, infra apicem circiter 7 mm. diametro. *Folia* ad apices ramulorum dense aggregata, oblanceolata, apice rotundata et emarginata, basi attenuata, 3–5 cm. longa, 1–1·7 cm. lata, juniora tenuiter chartacea, discoloria, supra fere glabra, infra molliter

pubescentia, nervis lateralibus utrinsecus circiter 12, a costa sub angulo recto abeuntes; petioli 4–5 mm. longi, pubescentes. *Flores* infra folia dense aggregati, pedicellis ex axillis foliorum delapsorum ortis recurvatis circiter 5 mm. longis pubescentibus. *Sepala* 3 + 3 vel 4 + 4 rare 5, ovata, 3·5 mm. longa, 1·5 mm. lata, praecipue exteriora extra pubescentia. *Corollae segmenta* sepalis isomera, oblongo-lanceolata, apice leviter denticulata, circiter 3·5 mm. longa, appendicibus lateralibus 2 paullo brevioribus. *Stamina* petalis isomera, opposita; filamenta ultra 2 mm. longa, a basi latiore linearia; antherae 1·5 mm. longae; staminodia oblonga, apice irregulariter dentata, vix 1 mm. longa. *Pistillum* 3·25 mm. longum, ovario breviter pubescente, stylo longiore glabro.

Tropical Africa. Southern Rhodesia: without definite locality or collector, *Herb. Dept. of Agric. S. Rhodesia* 2639.

1656. **Holmskioldia speciosa,** *Hutchinson et Corbishley* [Verbenaceae-Viticeae]; affinis *H. tettensi*, Vatke, sed foliis late ovatis crasse crenatis infra conspicue glandulosis calyce fructifero distincte lobato differt.

Ramuli lignosi, teretes, breviter et molliter pubescentes, lenticellis pallidis notati, internodiis circiter 2 cm. longis. *Folia* late ovata, apice triangularia, basi late cuneata, 2·5–4 cm. longa, 2–3 cm. lata, crasse crenata, crenis paucis (circiter 3) rotundatis, supra brevissime setulosa, infra pallidiora, conspicue glandulosa et breviter pubescentia, nervis lateralibus utrinsecus circiter 3 utrinque prominulis pubescentibus, venis laxis infra distinctis; petioli 7 mm. longi, dense pubescentes. *Flores* in cymas axillares pauciflоras usque ad 4 cm. longas dispositi; pedunculi graciles, molliter pubescentes; bracteae inferiores plus minusve foliaceae, spatulato-obovatae, usque ad 7 mm. longae; pedicelli ad 1·2 cm. longi, supra medium bracteolis oppositis linearibus pubescentibus minime 2 mm. longis. *Calyx* coloratus, accrescens, late turbinatus, extra glanduloso-pubescens, tubo 1 cm. longo, lobis late rotundatis apice mucronulatis nervosis rigide membranaceis fructiferis patulis usque ad 2·5 cm. expansis. *Corolla* 2–2·5 cm. longa, extra glandulosa et molliter pubescens; tubus ad 1·5 cm. longus, lobis circiter 0·6–1 cm. longis laxe pubescentibus. *Stamina* longe exserta, circiter 2·5 cm. longa, filamentis glabris, antheris 2 mm. longis. *Ovarium* superne pallide tomentosum; stylus stamina paullo excedens, gracilis, glaber. *Fructus* truncatus, 4-corniculatus, calyce accrescente inclusus.

South Africa. Transvaal: Komati Poort, 29 Nov. 1917, *I. B. Pole-Evans* 16879.

Holmskioldia is a small genus of *Verbenaceae* with a very curious distribution. In the foothills of the Himalaya (3000–5000 ft.) and in the Khasia Hills of India it is represented by one species *H. sanguinea*, Retz; in the basin of the lower Zambesi and Shiré Rivers of East Africa, *H. tettensis*, Vatke, *H. spinescens*, Vatke, *H. mucronata*, Vatke, occur; an unnamed species (Ambongo, *Perville* 672) has been found in Madagascar, while the new species described above, comes from the North-Eastern Transvaal. The genus is separated from *Clerondendron* and *Vitex*

by the rather frail characters of the simple leaves associated with the coloured accrescent calyx, which characters individually occur in both these genera. The distribution, however, might probably be explained by separate evolution from either of these genera in the respective areas.

1.—*Holmskioldia speciosa*, slightly reduced; 2.—opened calyx showing fruit × 2; 3.—corolla × 2.

1657. **Vitex Pooara**, *Corbishley* [Verbenaceae-Viticeae]; affinis *V. isotjensi*, L. S. Gibbs, sed minus hirsuta, foliolis angustioribus, cymis laxioribus, bracteis minoribus differt.

Arbor, ramis junioribus primum lanato-tomentosis demum ferrugineo-pubescentibus, vetustioribus glabrescentibus. *Folia* 3–5-foliolata; foliola sessilia, obovata, basi cuneata, apice rotundata et breviter cuspidata, 4–7·5 cm. longa, 1·7–3 cm. lata, supra breviter puberula, subtus pubescentissima et minute glandulosa, nervis secundariis utrinsecus 9–14 infra prominentibus; petioli usque ad 8·5 cm. longi, breviter tomentosi. *Inflorescentia* axillaris, foliis brevior; pedunculi usque ad 4 cm. longi, cymarum ramuli circiter 1 cm. longi, tomentosi; pedicelli circiter 1·5 mm. longi; bracteae lineares, 2–3 mm. longae, tomentosae. *Calyx*

campanulatus, obscure obliquus, ore 3 mm. diametro, repando-dentatus, intra glaber, extra hirsutus. *Corolla* (imperfecta tantum visa) bilabiata, calyce parum longior, extra breviter tomentosa, 3–5 mm. longa, lobis circiter 1 mm. longis, alabastro incurvis. *Stamina* inclusa. *Stylus* circiter 5 mm. longus, filiformis, breviter puberulus. *Fructus* drupaceus, ellipsoideo-globosus, usque ad 1·5 cm. diametro, 1·7 cm. longus, leviter 3-lobatus, basi calyce accrescente cupulari circiter 8 mm. longo cinctus.

South Africa. Transvaal: Modder Nek; Nijlstroom, Jan. 10, 1920, *I. B. Pole-Evans* 19671 (type); Nijlstroom to Springbok Flats, March 6, 1904, *J. Burtt-Davy* 1722; near Warm Bath, Waterberg, Jan. 1906, *H. Bolus* 12233.

Vernacular name "Pooar" (Burtt-Davy).

1658. **Hymenocardia capensis,** *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *H. ulmoidi,* Oliv., sed foliis plantae foemineae minoribus apice rotundatis (haud breviter acuminatis), fructus lobis apice imbricatis differt; syn. *H. ulmoides,* var. *capensis,* Pax in Engl. Bot. Jahrb. xxviii. 22; *H. ulmoides,* Hutchinson in Dyer, Fl. Cap. v. 410, partim, non Oliv.

Frutex circiter 1·25 m. altus et 1·75 m. diametro; ramuli juniores brevissimi, puberuli, annotini cinerei, glabri. *Folia* oblanceolata vel obovato-elliptica, basi breviter cuneata, apice rotundata, 1–2 cm. longa, 0·7–1 cm. lata, firme chartacea, glabra, infra pallida; nervi laterales utrinsecus 3–4, prominuli; petioli 2–3 mm. longi, puberuli; stipulae mox deciduae. *Inflorescentiae* ♂ in ramulis lateralibus brevibus confertae, circiter 1·3 cm. longae; axis gracillimus, puberulus; bracteae late spathulatae, ciliatae. *Calyx* profunde 5-lobus, lobis rotundatis dense ciliatis. *Racemi* ♀ ramulos laterales breves terminantes, usque ad 4-flori; pedicelli fructiferi graciles, 4–8 mm. longi, glabri. *Fructus* breviter stipitati, late orbiculares, late alati, circiter 1·5 cm. diametro, glabri, alis basi connatis apice imbricatis.

South Africa. Delagoa Bay; Matola, *Schlechter* 11725 ♂. Polana, near Lorenzo Marques, sandy soil, fr. 11 Jan. 1920, *J. M. Borle* 301 (Herb. Pretoria).

In dealing with this genus for the Flora Capensis I had only Schlechter's male specimen before me, and it was considered to be a form of *H. ulmoides,* Oliv., from Tropical Africa. The arrival of a good fruiting specimen collected near Lorenzo Marques, and communicated by the Chief of the Division of Botany, Pretoria, shows this Delagoa Bay plant to be an undescribed species, differing from *H. ulmoides* in its smaller and round-tipped leaves and the overlapping wings of the fruit.

1659. **Phyllanthus inflatus,** *Hutchinson* [Euphorbiaceae-Phyllantheae]; inter species africanas ramulis vetustioribus pulviniformibus hornotinis solitariis vel geminatis elongatis, fructibus magnis inflatis valde distincta.

Frutex 5–6 m. altus; ramuli vetustiores breves, pulviniformes, perulis persistentibus ornati; ramuli hornotini elongati, usque ad 30 cm. longi, graciles, glabri. *Folia* ovata, breviter subacute

acuminata, basi rotundata, 4–4·5 cm. longa, circiter 2 cm. lata, tenuiter chartacea vel submembranacea, glabra, utrinque laxe reticulata; nervi laterales utrinsecus circiter 7, a costa sub angulo fere 90° abeuntes, infra prominentes; petioli 2·5 mm. longi, teretes, glabri; stipulae subulatae, acutae, 3 mm. longae. *Flores* non visi. *Fructus* vesiculosi, magni, circiter 3 cm. diametro, siccitate pallide virides vel straminei, glabri. *Semina* oblique reniformia, circiter 6 mm. lata, striata.

Tropical Africa. Eastern Sudan: Lado; Yei river, shrub 15–20 ft., *F. Sillitoe* 321.

This is a very remarkable species of *Phyllanthus*, and easily distinguished amongst the African species by its pulviniform older branches and large bladder-like capsules.

1660. **Bobartia Keetii**, *Phillips* [Iridaceae - Aristeae]; affinis *B. gracili*, N.E. Br., et *B. robustae*, Baker, sed ab illa capsulae valvis rugosis, ab hac habitu graciliori pedicello pubescente, bracteis paucioribus differt.

Planta 30–60 cm. alta. *Rami* paullo compressi, glabri. *Inflorescentia* 2–4-florifera. *Spatha* 3–6·5 cm. longa, acuminata, glabra. *Bracteae* 5, 1·5–2·5 cm. longae, lanceolatae, acutae vel aristatae, glabrae. *Pedicellus* 5 mm. longus, pubescens. *Tubus* 4 mm. longus, 3 mm. latus, glaber; lobi 1·7 cm. longi, 0·6–1 cm. lati, ovato-oblongi, apice emarginati callosique. *Filamenta* 2 mm. longa, linearia; antherae 9 mm. longae, lineares. *Ovarium* 7 mm. longum, 2·5 mm. latum, glabrum, paullo rugosum; stylus 6·5 mm. longus, linearis; lobi truncati, apice papillosi. *Fructus* 0·6–1 cm. longus, 5–9 mm. latus, tuberculatus. *Semina* 3 mm. longa, curvata.

South Africa. Knysna Division, *Keet* 26 and in *National Herbarium* 799.

Approaches *B. gracilis*, N.E. Br., in habit but differs in having rugose valves in the capsule. In this respect it is allied to *B. robusta*, Baker, but has a more slender habit.

Named in compliment to Mr. J. D. Keet, Forest Officer at Knysna, who has been making a careful study of the local flora.

LIV.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES C.–CI.

991. **Berberis Osmastonii**, *Dunn* [Berberidaceae - Berbereae]; *B. pruinosae*, Franch., affinis, sed floribus solitariis brevipedunculatis, foliis linearibus distincta.

Frutex pumilus, robustus, saepius 15 cm. altus, omnino glaber, ramis hornotinis angulatis lucidis flavis, vetustioribus griseis; spinae trifidae, graciles, 1–1·5 cm. longae. *Folia* 5–7-nim fasciculata, linearia, integerrima, apice pungentia, basi cuneata, sessilia, supra viridia, subtus eburnea, utrinque nitentia, enervia,

margine paullo involuta, 1·5–2 cm. longa, 3 mm. lata. *Flores* axillares, solitarii, erecti, flavi, 0·7–1 cm. diametro; pedicelli 5 mm. longi, basi bracteis minutis linearibus suffulti. *Sepala* externa aequalia, lineari-lanceolata, 2 mm. longa. *Petala* gradatim majora, ad 6 mm. longa, obovata, basi attenuata, duobus nectariis instructa. *Stamina* ovarium aequantia. *Ovarium* breviter stylosum. *Fructus* ovoideus, atro-coeruleus, glaucus, 1 cm. longus.

Central Himalaya: Garhawl 2700–3000 m., *Osmaston* 225 (fruit) 18-5-15; Kheta Nawali Reserve at 2900 m., *Osmaston* 894, 919 (flowers) 15-5-18.

Osmaston's Barbery should be placed in Schneider's enumeration as No. 35a, next to *B. pruinosa*, Franch. (see *C. K. Schneider* in *Bull. Herb. Boiss.* Series 2, v. 400).

992. **Erysimum Melicentae,** *Dunn* [Cruciferae-Sisymbrieae]; ab *E. odorata*, Ehrh., floribus majoribus, petalis aurantiacis, siliquisque erectis distinctum.

Herba biennis, 30–70 cm. alta. *Caulis* saepe simplex. *Folia* radicalia et caulina lineari-lanceolata, apice acuta, basi attenuata, sessilia, 6–8 cm. longa, distanter et obscure dentata, pilis bipartitis et tripartitis appressis mixtis obsita. *Racemi* primo densiflori, demum longe extensi. *Flores* magni, 1·5 cm. longi et lati, aurantiaci; pedicelli 5 mm. longi. *Sepala* erecta, lineari-oblonga, obtusa, appresse puberula, membranacea, venosa, 8–9 mm. longa; lateralia basi saccata. *Petala* ampla, sepalis duplo longiora; unguis gracilis, laminae obovatae aequalis. *Stamina* sepalis aequilonga vel sublongiora, longioribus superne dilatatis dorso subalatis. *Antherae* lineares, profunde bilobae. *Ovarium* 4-gonum; stylus elongatus; stigma discoideum, dilatatum. *Siliquae* striatae, erectae, pedicellatae, canae, tetragonae, 4–6 cm. longae, stylo subgracili terminatae; valvae carinatae, nervo medio valido percursae; replum tenue; septum completum, enerve. *Semina* plurima, conferta, 1-seriata; testa punctulata.

India. Kashmir; 2300–2700 m., *T. Thomson;* pass of Darawai, 3000 m., *Winterbottom;* on the South side of Fezipore Nullah close to Gulmarg, *Melicent Wathen.*

In the Fl. Brit. Ind. i. 154, Hooker doubtfully refers certain Kashmir specimens to the European *E. odoratum*, Ehrh. (Beitr. vii. 157). Further knowledge of that plant justifies Hooker's caution and shows it to be necessary to find a new name for the Kashmir plant. The above diagnosis is drawn from flowering specimens in the Kew herbarium together with Thomson's notes on the fruit. Among the other material at Kew is a small specimen presented along with her other dried plants by Mrs. Wathen, and the opportunity is taken of dedicating it to her and at the same time of placing on record the numerous additions to the Indian flora which have been recognised from her beautiful coloured sketches of Kashmir plants supported by correspondingly numbered dried specimens. Such are *Moneses uniflora*, Gray (previously known no nearer than Turkestan), and *Tulipa praecox*, Ten., from Persia.

993. **Dioticarpus,** *Dunn*, gen. nov. [Dipterocarpaceae]; a *Balanocarpo*, Bedd., sepalis 2 in alas breves auriformes auctis differt.

Calycis tubus subnullus, toro adnatus; lobi sub anthesi breves, obtusi, ita imbricati, ut bases interiorum ab exterioribus fere occlusae; lobi maturi 2, caeteris bis longiores, patentes, recurvi. *Stamina* 15; filamenta basi expansa; antherae ovatae, connectivo in capillum producto. *Ovarium* 3-loculare, loculis 2-ovulatis. *Stylus* breviter subulatus. *Fructus* indehiscens, 1-spermus, intra bases calycis loborum inclusus. *Semen* globosum; cotyledones crassi, inaequales, 2–3-lobi, radicula in fossa externa prominente. —Arbores resinosae, inflorescentia cano-tomentosa. Stipulae caducae. Folia integerrima, coriacea, penninervia, reticulato-venulosa. Flores parvi, secus ramos paniculae 1-seriatim subsessiles.

D. Barryi, *Dunn*, sp. unica.

Arbor magna, praeter inflorescentiam glabra. *Folia* longe petiolata, oblongo-lanceolata, ad apicem rotundatum angustata, basi obtusa, 9–11 cm. longa, papyracea, nervis lateralibus 10–11-paribus cum tertiis prominulis; petioli 2 cm. longi. *Paniculae* axillares, foliis breviores, ut calyces et petala extus omnino breviter albo-tomentosae. *Flores* secundum ramos in uno latere subsessiles, 6 mm. longi. *Calyx* 5-lobus, 2 mm. longus; lobi ovati imbricati, 3 exteriores bases interiorum occludentes. *Petala* 5, oblonga, unguiculata, torta, apice breviter lacera. *Stamina* 15, 1–1·5 mm. longa; filamenta basi dilatata; connectivum in appendicem capillarem productum. *Ovarium* 3-loculare, 1·5 mm. longum, conicum; ovula 5–6; stylus subularis. *Fructus* indehiscens, globosus, apiculatus, 2 cm. diametro, 1-spermus, in calycis loborum basibus induratis laxe inclusus, lobis 2 exterioribus in alas patulas paullo decurvas 2–2·5 cm. longas auctis.

South India. Madras Presidency: in evergreen forest near the Kuduvarai river, 300 m., a solitary tree, *Barry;* abundant on the Tinnevelly Hills, *Beddome* 27; Kannikatti to Karyar, Tinnevelly, *Barber* 3163; Tinnevelly, *Hayne* 213B.

The tree is known to yield a very valuable timber, and was considered at the District Forest Office at Tinnevelly to be quite distinct from other allied species. Specimens were therefore sent to Kew by Mr. W. C. Hart, Deputy Forest Officer. They proved to represent a new genus near *Balanocarpus*, Bedd. It can be certainly distinguished from that genus by the two elongated fruiting sepals and by the fact that all the enlarged sepals are divided nearly down to the fruit-stalk and spread loosely round the ripe nut instead of forming a closely investing gamosepalous cup as in Beddome's genus.

994. **Indigofera cedrorum,** *Dunn* [Leguminosae-Galegeae-Indigofereae]; *T. puchellae*, Roxb., racemis pedunculatis floribus minoribus coeruleo-purpureis differt.

Frutex 1 m. altus, ramis gracilibus pallidis. *Folia* imparipinnata, 5–10 cm. longa; foliola (2–) 7–11-paria, ovata, mucronulata, 1–2 cm. longa, supra subglabra, subtus tenuiter adpresse

pubescentia; primo stipellata. *Racemi* foliis paullo breviores, pedunculis tandem duplo longiores. *Flores* subsessiles, 0·8–1 cm. longi, coeruleo-purpurei, bracteis cymbiformibus caudatis primo tecti. *Calyx* fere explanatus, 2 mm. longus, ut vexillum molliter sericeus; dentes breves, triangulares. *Vexillum* obovatum, 8 mm. longum, ungue subnullo. *Legumen* cylindricum, in acumen conicum breve subito acuminatum. *Semina* 6–10.

India. Chamba State: the commonest shrub in the undergrowth of the Deodar Forest in Chitkuri Reserve, flowering in May and June, fruiting in August, 1300–2000 m., *Parker* 2, 3, 4, 41, 42, 43; Kashmir, 1700–2000 m., *Thomson*.

Mr. Parker first drew my attention last year to the probable existence of this new species in Chamba, and has since sent abundant and excellent material to substantiate his opinion. He notes, incidentally, that the first leaves produced have fewer leaflets than those appearing later in the growing season. Leaflets on the stool-shoots attain as much as 2·5 cm. in length.

995. **Caragana Hoplites,** *Dunn* [Leguminosae-Galegeae-Astragaleae]; a *C. jubata*, Poir., foliolis laxe pubescentibus (non dense villosis) prominenter venosis (nec evenliis) differt.

Frutex erectus, ad 2 m. altus, ramosus, cortice rubescente tandem griseo rugoso; rami dense foliati, undique petiolis persistentibus spinosis glabris 2·5–3·5 cm. longis horridi. *Folia* solitaria vel 2–3-na, cum bracteis 4–6 scariosis ovatis 4–5 mm. longis fasciculata, 4–5-juga, petiolata, 2–3 cm. longa; foliola oblanceolato-linearia, apiculata, 7–9 mm. longa, ut calyces laxe pubescentia pilis sericeis, nervis secondariis infra prominentibus 4–6-paribus. *Pedunculi* solitarii, e foliorum fasciculis orti, uniflori, breves, sub flore bibracteolati. *Flores* 2·5 3 cm. longi. *Calyx* tubulosus, 1·5 cm. longus; dentes lanceolati, acuminati, tubum aequantes. *Petala* alba vel pallide rosea, calyce duplo longiora; vexillum late obovatum, longe unguiculatum, lateribus reflexis; alarum auriculae lineares, unguem fere aequantes; carina cum alis vexillo brevior, basi auricula brevi instructa. *Ovarium* dense pubescens. *Legumen* non visum.

India. N. Garhwal: Nandagiri Valley, 3000–3200 m., flowering in June, *Osmaston* 1088.

996. **Centratherum Rangacharii,** *Gamble* [Compositae-Vernonieae]; *C. molli*, Benth., et *C. courtallensi*, Benth., affinis; ab utroque capitulis minoribus et foliis fere semper sessilibus differt, ab hoc etiam phyllariis scabridis, ab illo phyllariis non lanatis distinguendum.

Herba erecta, annua (?), ramulis elongatis striatis furfuraceo-villosis. *Folia* lanceolata, apice acuta, mucronata, in ramulis foliiferis basi fere amplexicaulia, in floriferis attenuata, supra strigoso-hirsuta, subtus nervis exceptis albo-tomentosa, margine paullo crenulata, 2–7 cm. longa, 1–2 cm. lata; nervi primarii utrinque 8–12, subtus conspicui et nervulis conspicuis juncti; petiolus in foliis ultimis nullus, in inferioribus praecipue in ramulis floriferis brevissimus. *Capitula* solitaria, longe-pedunculata, bracteis exterioribus 1–2 folia simulantibus munita; phyllaria inferiora basi scariosa, glabra, supra ovata, foliacea,

strigoso-hirsuta, conspicue nervosa, superiora gradatim longiora, ultima omnino scariosa; receptaculum areolatum. *Corolla* tubularis, elongata, purpurea, lobis 5 brevibus angustis. *Achaenia* glabra, obtusa, 10-costata; pappus e setis 1–4 brevibus scabris perdeciduis sistens.

South India. Tinnevelly District: Mahendragiri and Naterikal; 1914 and 1916, *K. Rangachari* Herb. Madras. 10910, 13195, 13356; Kalivayalpil to Travancore boundary, alt. (probably) from 1000 to 2000 m., May, 1901, *C. A. Barber* 3030.

997. **Vernonia anamallica,** *Beddome* MS. (Herb. Madr.) *ex Gamble* [Compositae-Vernonieae]; species distincta ramulis et foliis subtus appresse aureo-tomentosis, achaeniis pentagonis glabris sed glandulosis et corollis brevibus insignis.

Frutex erectus, ramulis crassis striatis aureo-fulvis. *Folia* elliptico-lanceolata, apice acuta, margine brevissime crenato-serrata, supra nervis puberulis exceptis glabra, subtus appresse aureo-tomentosa, 6 9 cm. longa, 2–3 cm. lata; nervi primarii utrinque 8–10, graciles, curvati, reticulatione ob lanuginem obscura; petiolus 5–8 mm. longus. *Capitula* 1 cm. lata, in corymbis subterminalibus breviter pedunculatis 5 cm. latis, pedicellata; phyllaria brevia, ovata, mucronata, pubescentia. *Corolla* brevis, 2–3 mm. longa, lobis brevibus tubum aequantibus. *Achaenia* pentagona, glabra, glanduloso-punctata; pappus exterior setaceus, brevissimus, interior ad 5 mm. longus, deciduus.

South India. Anamalai hills; in the higher ranges, 1873, *R. H. Beddome* (Herb. Madr.).

998. **Vernonia Bourdillonii,** *Gamble* [Compositae-Vernonieae]; *V. Wightianae,* Arn., affinis, foliis minoribus ad apices ramulorum congestis, corymbis paucifloris, phyllariis majoribus acuminatis differt; *V. Ramaswamii,* Hutch., etiam similis, quoad corymbos paucifloros, sed foliis brevioribus subtus fulvo-tomentosis differt.

Frutex erectus, plus quam 1 m. altus, ramulis crassis nodosis fulvo-pubescentibus foliis apices versus congestis. *Folia* oblanceolata, apice obtusa, basi attenuata, margine obscure crenata supra ad nervos et subtus dense crispato-fulvo-tomentosa, ad 5 cm. longa, circiter 1 cm. lata; nervi primarii obscuri, utrinque 6–7, curvati; petiolus vix ad 5 mm. longus, basi subamplexicaulis. *Capitula* in corymbis 1–3-natis terminalibus et axillaribus, 1–1·5 cm. lata, pedunculis ad 12 cm. longis supra bracteatis, pedunculis ultimis 1–2 cm. longis; phyllaria lanceolata, acuminata, subaequilonga (circiter 5 mm.), extus crispato-pubescentia. *Corolla* infundibularis, extus puberula, lobis brevibus. *Achaenia* 4–5-gona, plerumque 4-gona, fere glabra sed glandulosa, 2 mm. longa; pappus exterior brevis, paleaceus, fimbriatus, interior lutescens, cito deciduus.

South India. Hills of Travancore at Chimunji and other localities in grassland at elevations of 1300 m. and higher, April, 1898 and 1903, *T. F. Bourdillon* 972 and 1379; Ponmudi, Feb., 1914, *M. Rama Rae* 2363.

999. **Vernonia gossypina,** *Gamble* [Compositae-Vernonieae]; *V. salvifoliae*, Wight, annis, capitulis minoribus, foliis latioribus eximie lanatis, achaeniis trigonis glandulosis differt.

Frutex erectus, ramulis crassis albo-lanatis, ultimis lanugine longissima inter folia congesta tectis. *Folia* sessilia, lanceolata, apice acuminata, basi subamplexicaulia, margine minute serrata, supra juventute albo-sericea, demum nervis exceptis subglabra, rugosa, subtus semper lanugine alba ad costam longa tecta, ad 15 cm. longa, 5 cm. lata; nervi primarii circiter 15–16 reticulatione areolata et lanata juncti. *Capitula* in corymbis longe pedunculatis terminalibus et axillaribus 7 cm. latis, brevissime pedicellata, vix 5 mm. longa, 3 mm. lata, 5-flora; flores purpurei; phyllaria ovata, parva, marginibus araneoso-lanata, apice acuta, rufescentia. *Corolla* infundibularis, 3 mm. longa, glabra et glandulosa, lobis brevibus recurvis. *Achaenia* trigona, annulo crasso coronata, inter costas multiglandulosa, 1 mm. longa; pappus exterior paleaceus, fimbriatus, interior 3 mm. longus, paucisetosus, cito deciduus.

South India. Tinnevelly District: between Naterikal and Sengalteri; probably about 1000–2000 m., 1916–17, *K. Rangachari* 13624, 14536 (Herb. Madras).

1000. **Vernonia Heynei,** *Bedd.* MS. (in Herb. Madr.) *ex Gamble* [Compositae-Vernonieae]; *V. indicae*, C. B. Clarke, et *V. Fysoni*, Calder, similis, praecipue quoad capitula parva, sed phyllariis obtusis latis differt.

Frutex erectus, ramulis crassis sulcatis griseo-puberulis. *Folia* sessilia, elliptico-lanceolata, apice acuminata, basi attenuata et in petiolum decurrentia, margine serrata, mucronata, dentibus recurvis, supra nervis exceptis glabra, subtus dense et appresse albo-tomentosa, 10–12 cm. longa, 4–5 cm. lata; nervi primarii utrinque circiter 10, paralleli, nervulis transversis obscuris juncti. *Capitula* in corymbis pedunculatis terminalibus 10 cm. latis, pedicellata, circiter 1 cm. longa et lata et 12-flora; flores purpurei (?); phyllaria inferiora ovata, acuminata, ciliata, pubescentia, superiora obtusa et fere glabra, mucronata. *Corolla* gracilis, ad 7 mm. longa, lobis brevibus. *Achaenia* eximie 10-costata, glabra; pappus rufescens, 7 mm. longus, seriei exterioris brevissimus.

South India. Travancore Hills, *R. H. Beddome* 1873 (Herb. Madras).

1001. **Vernonia multibracteata,** *Gamble* [Compositae-Vernonieae; *V. salvifoliae*, Wight, similis, quoad lanuginem ramulorum et foliorum paginarum inferiorum, sed phyllariis et achaeniis omnino discrepans.

Frutex erectus, ramulis crassis albo-lanatis. *Folia* lanceolata, acuminata, basi attenuata et in petiolum decurrentia, margine crenulata, supra rugosa et pilis moniliformibus tecta, subtus molliter appresse albo-lanata, ad 20 cm. longa, 6 cm. lata; nervi primarii utrinque 18–20, paralleli et reticulatione obscura juncti; petiolus 1–2 cm. longus, crassus, albo-lanatus. *Capitula* in corymbis terminalibus patulis 10–12 cm. latis, lanugine alba vel

paulla fulvida tecta, pedicellata, oblonga, 1·5 cm. longa, 1 cm. lata; phyllaria permulta, lanceolata, circiter 1 cm. longa, exteriora longe acuminata, albo-araneosa, intermedia fere glabra, scariosa, superiora paullo breviora, mucronata. *Corolla* cylindrica, glabra, 4 mm. longa, lobis brevibus. *Achaenia* tetragona, angulis alatis, glabra, brevia; pappus exterior paleaceus, fimbriatus, interior e setis circiter 5 deciduis sistens.

South India. Travancore: Peermerd; 1000 m., Dec., 1880, *R. H. Beddome.*

1002. **Vernonia pulneyensis,** *Gamble* [Compositae-Vernonieae]; *V. pectiniformi,* DC., affinis, corymbis paucifloris breviter pedunculatis, phyllariis albidis apice solum coloratis et foliis ovatis paucinerviis margine distanter serratis differt.

Suffrutex subherbaceus, ramulis striatis pilis moniliformibus longis tectis. *Folia* ovata, membranacea, apice acuta, mucronata, basi in petiolum attenuata, margine distanter serrata, supra praecipue ad nervos pilis moniliformibus sparsim ornata, subtus villosa, 5–10 cm. longa, 2–4 cm. lata; nervi primarii utrinque 6–7, curvati et reticulatione juncti; petiolus gracilis, circiter 5 mm. longus. *Capitula* in corymbis terminalibus vel aliquando axillaribus subsessilia, 1 cm. longa et lata, 12–15-flora; flores purpurei; phyllaria inferiora ovata, longe mucronata, superiora gradatim longiora, ultima scariosa, straminea, obtusa, 5 mm. longa, omnia rufescentia apice excepto albido, ciliata et parce araneosa. *Corolla* gracilis, 5 mm. longa, in lobis 5 brevibus divisa. *Achaenia* eximie 10-costata, glabra; pappus albidus 5 mm. longus, cito deciduus.

South India. Pulney Hills: Banks of the Pambar river at Kodaikanal; 2300 m., in thin forest, April, 1916, *P. F. Fyson* 4057, 4130.

1003. **Vernonia shevaroyensis,** *Gamble* [Compositae-Vernonieae]; *V. volkameriaefoliae,* DC., affinis, capitulis unifloris et foliis subtus scabride pubescentibus differt.

Arbor parva (?) ramulis crassis ultimis nigris pubescentibus. *Folia* oblanceolata, apice acuta, basi in petiolum brevem crassum attenuata, margine integra vel repando-crenata, supra nervis exceptis glabra, subtus scabride pubescentia, 16–24 cm. longa, 5–8 cm. lata; nervi primarii utrinque 10–12, distantes, prominuli, marginem versus curvati et nervulis irregularibus prominentibus juncti; petiolus vix 1 cm. longus. *Capitula* in paniculis terminalibus numerosa, parva, uniflora; flores purpurei (?); phyllaria oblonga, dorso sericeo-villosa, inferiora parva, obtusa, superiora longiora, acuta. *Corolla* elongata, circiter 1 cm. longa, ad medium in lobos 5 lineares divisa, extus puberula. *Achaenia* obscure 10–costata, costis vix prominentibus, basin versus attenuata, inter costas glandulosa; pappus stramineus, 1 cm. longus, setis exterioribus et interioribus aequalibus.

South India. Shevaroy Hills; *Perrottet* collection, no. 376 (Herb. Calcutta).

1004. **Helichrysum perlanigerum,** *Gamble* [Compositae-Inuloideae]; *H. Wightii,* C. B. Clarke, affinis, lanugine molli

floccosa cinnamomea conspicua, foliis latioribus tenuioribus costis non appressis et bracteis involucri interioribus acutis differt.

Suffrutex perlaniger, scaposus. *Folia* basalia stellatim patentia, e basi lata lanceolata, acuta, submembranacea, 5-costata, utrinque lanugine molli cinnamomea praedita, 6–7 cm. longa, 2–2·5 cm. lata, caulina lanceolata, acuta scapo-appressa, 2–3 cm. longa, 1 cm. lata. *Flores* capitulorum exteriores ♀, in una vel aliquando duobus seriebus, interiores permulti, ♂, omnes fertiles; capitula sessilia ad ramos corymbi terminalis congesta, inflorescentiam ad 10 cm. latam formantia; rami et ramuli et capitula ad basin lanugine molli cinnamomea dense tecti. *Bracteae* involucrantes albidae vel flavo-albidae, ovatae, exteriores obtusae, interiores acutae. *Corollae* florum ♀ graciles, 2–3-dentatae, florum ♂ tubulares, lobis 5 patentibus glandulosis. *Achaenia* minuta, obovoidea, minute squamosa; pappus uniserialis, parce plumosus.

South India. Anamalai Hills of Coimbatore; about 2000 m., *R. H. Bedome* (Herb. Madras).

1005. **Senecio Lawsoni,** *Gamble* [Compositae-Senecioniideae]; *S. lavandulifolio,* DC., affinis, foliis minoribus per totum caulem regulariter dispositis, corymbis paucifloris et ligulis plurinerviis differt.

Herba perennis erecta, ramulis e basi gracilibus ad 35 cm. longis villosis. *Folia* linearia, sessilia, apice mucronata, marginibus ad costam reflexis, 10–17 mm. longa, costa villosa excepta glabra. *Capitula* in corymbo terminali 1–6-cephalo, circiter 10–15 mm. lata; floribus exterioribus ♀ 15–20 ligulatis, interioribus ♂ tubulosis, omnibus flavis fertilibus. *Phyllaria* circiter 20, lineari-lanceolata, apice acuta ciliata, margine scariosa, dorso albo-villosa, infra bracteis brevibus linearibus munita, 5–7 mm. longa. *Corollae* florum ligulatorum reflexae, 2 mm. latae, 5–7-nerves florum tubulosorum graciles, 4 mm. longae, lobis 5-parvis. *Antherae* basi ecaudatae. *Achaenia* anguste oblonga, glabra, pauci-costata. *Pappus* albus, disci floribus aequalis.

South India. Nilgiri Hills: on grassy downs between Avalanché and Sispara; about 3000 m., Nov. 1883, *J. S. Gamble* 13427; Nov. 1887, *M. A. Lawson* 44.

1006. **Diospyros impressa,** *Dunn et R. Williams* [Ebenaceae]; a *D. Brandisiana,* Kurz, cui quoad inflorescentiam floresque consimillima, foliis adultis subtus molliter pubescentibus et nervis circiter 16-jugis supra impressis venisque transversis supra plane obscuris differt.

Arbor dioica, cortice griseo-brunneo. *Folia* chartacea, elliptico-oblonga vel oblongo-lanceolata, apice acuminata, basi acuta, adulta supra glabra, subtus ferrugineo-pubescentia, 21–27 cm. longa, 5–9 cm. lata, nervis 16-paribus supra impressis subtus prominentibus, venis transversis plane obscuris. *Cymae* densiusculae, ramosissimae, in ligni vetusti nodis congestae, ut bracteae et calyces atro-fusco-tomentosae; bracteae minutae, oblongo-lanceolatae, *Flores* ♀ tantum visi.

Calyx 2 mm. longus, 5-partitus, lobis acutis. *Corolla* adpresse fulvo-pubescens; tubus versus basin subampliatus, 5-angularis, 6 mm. longus; lobi 5, oblongi, obtusi, 6 mm. longi. *Stamina* reducta; filamenta ad 3 mm. longa, pubescentia. *Ovarium* dense fulvo-pubescens, 10-loculare; stylus 4 mm. longus, 5-fidus. *Ovula* solitaria, suspensa.

India. Burma: Papun (about 150 miles N.E. of Rangoon), *Meebold* 17253.

1007. **Trachelospermum anceps,** *Dunn et R. Williams* [Apocynaceae-Echitideae]; *T. laurifolio*, Ridley, similis sed foliis magnis basi obtusis differt.

Arbor parva. *Folia* opposita, obovato-lanceolata vel oblongo-lanceolata, apice abrupte acuminata, basi obtusa vel rotundata, 24–38 cm. longa, 9–11 cm. lata, supra chartacea, glabra, subtus pilis brevibus sparsis mollia; nervi 16-pares, subtus prominentes, intra marginem anastomosantes, costa fortissima; petioli 1–1·5 cm. longi. *Flores* in cymis puberulis brevibus umbelliformibus circiter 10-floris; pedunculi 1–2 cm. longi; pedicelli graciles, 2–3 cm. longi, basi fracteis brevibus ovatis instructi. *Calyx* 5-partitus; lobi 5, late ovati, 4–5 mm. longi. *Corollae* tubus supra contractus, intus pilis in fauce dense instructus; lobi 5, lati, contorti, dextrorsum obtegentes, 10 mm. longi. *Stamina* in summo tubo affixa, filamentis brevissimis; antherae exsertae, acutae, basi sagittatae, circa stigma in conum connivентes et ei medio adhaerentes; connectivum dorso basi tuberculo carnoso conspicuo instructum. *Discus* annularis, 5-lobus. *Ovarii* carpella 2, primum connata; stylus filiformis, 5–7 mm. longus; stigma breve, ovatum, apiculo instructum. *Fructus* non visus. *Vallaris ? anceps*, Wall. Cat. 1622.

Lower Burma. Tenasserim: Tavoy; flowers, April 1911, *Meebold* 14966; Kyautalan, flowers, Mar. 1911, *Meebold* 15408: Mergui; Letpanthaung, flowers, Mar. 1911, *Meebold* 14654.

1008. **Hoya burmanica,** *Rolfe* [Asclepiadeae-Marsdenieae]; affinis *H. lanceolatae*, Wall., sed floribus multo minoribus et coronae lobis latioribus differt.

Fruticulus ramosus, 25–40 cm. altus. *Rami* teretes, pallidi, 20–25 cm. longi, subpenduli. *Folia* subpendula, breviter petiolata, anguste ovato-lanceolata, acuminata, subconcava, crassiuscula, glabra, glauco-viridia, 5–8 cm. longa, 1·3–2 cm. lata; petioli 5 mm. longi. *Umbelli* terminales et axillares, breviter pedunculati, pauciflori; pedunculi parce pubescentes, 5 mm. longi. *Bracteae* squamulosae, pubescentes, 0·5 mm. longae. *Pedicelli* graciles, glabri, 1–1·2 cm. longi. *Flores* circiter 1 cm. diametro, lutei, coronae basi purpureo-suffusi. *Sepala* ovato-lanceolata, subacuta, glabra, 2·5 mm. longa. *Corolla* rotata, circiter 1 cm. diametro, velutina; lobi ovati, apice recurvi, acuti. *Coronae* lobi stellato-patentes, elliptico-ovati, obtusi, subconcavi 2·5 mm. longi, basi purpurei.

India. Burma; Chin Hills.

Flowered in the Orchid House of Lieut.-General Sir Arthur

G. F. Browne, K.C.B., Lower Bourne, Farnham, Surrey, in August, 1920, the plant having been received with a number of Orchids from a friend in the Chin Hills, Burma.

The flowers are deep yellow, with a red-purple stain at the base of the corona-lobes.

1009. **Tupistra veratrifolia,** *Kurz MS. ex Dunn* [Liliaceae-Aspidistreae]; a *T. Stoliczkana,* Kurz, perianthii tubo 1–2 mm. (non 3 mm.) longo, pedunculo spicam aequante (non bis longiore) differt.

Herba robusta, rhizomate repente crasso. *Folia* basi cataphyllis oblongis obtusis membranaceis tandem fibrosis cincta, 1–3, oblanceolata, acuminata, 1 m. alta, 10–15 cm. lata, in petiolum 15–20 cm. longum attenuata, integerrima, glabra, nitentia. *Spicae* erectae, densiflorae, sub anthesi ad 7 cm. longae, fructu 25 cm. longae, pedunculo aequilongo suffultae; bracteae floribus breviores. *Flores* 7·5 mm. diametro, glabri. *Perianthii* tubus brevissime campanulatus, 1–2 mm. longus; lobi 6, patentes, oblongi, obtusi, 3 mm. longi. *Stamina* 6; filamenta brevissima, tubo inserta, perianthii lobis opposita. *Ovarium* parvum, sessile, 3-loculare; stigma peltatum, trilobum, ovario latius. *Bacca* immatura globosa.

India. Khasia Hills and Brahmaputra plains, *Kurz.* Eastern Himalaya. Outer Abor Hills, Janakmukh, *Burkill* 37281. December 19th, 1911.

The two sheets from which the flowering plant is described were found under a cover in the Calcutta Herbarium inscribed with the above name in Kurz's handwriting. They represent the type of the species. Both were lent to Kew to compare with Burkill's fruiting specimen with which they agree. The opportunity is taken of publishing Kurz's MS. name. One of the sheets is returned to Calcutta, the other by Lt.-Col. A. T. Gage's courtesy is retained in the Kew Herbarium.

1010. **Arundinaria Murielae,** *Gamble* [Gramineae-Bambuseae]; species formosa, *A. nitidae,* Mitford, affinis, foliis petiolatis majoribus longissime setaceo-acuminatis differt.

Frutex caespitosus, ramosissimus, culmis gracilibus aureis glabris sed juventute insigniter cera alba munitis circiter 7–10 mm. diametro 2–4 m. altis, internodiis inferioribus 20 cm. longis. *Vaginae* culmorum stramineae, striatae, glabrae sed margine ciliatae, apice rotundatae, vix auriculatae, 10–12 cm. longae; pseudophylla reflexa, 4–6 cm. longa, angustissima, ligula perbrevi. *Folia* oblongo-lanceolata, submembranacea, apice longissime setaceo-acuminata, basi plus minusve rotundata, 7–12 cm. longa, 1–1·5 cm. lata, marginibus hyalinis praecipue superne scabris, nervis secundariis utrinque 4–5, venulis transversis permultis conspicuis approximatis; petiolus gracilis, 3–4 mm. longus; vaginae striatae, glabrae, ore paullo productae et ciliis 1–3 cito deciduis munitae; ligula 1 mm. longa, brevissime ciliolata. *Ramuli* foliacei, ad nodos culmorum aggregati, unus vel duo satis longe producti, reliqui breves, omnes basi bracteis stramineis culmorum

vaginis similibus muniti. *Flores* et caryopsis adhuc ignoti. *Arundinaria* sp., Rendle in Plantae Wilsonianae, ii. 64.

China. Western Hupeh: Fang Hsien, uplands at 2000–3000 m. alt., *E. H. Wilson* 1462.

Description from specimens taken from clumps cultivated in the Bamboo Garden, Royal Botanic Gardens, Kew, in August 1920 (by W. J. Bean and J. S. Gamble). By Mr. Wilson's special wish the species is dedicated to his daughter, Muriel Wilson.

This Bamboo was presented to Kew from the Arnold Arboretum in the autumn of 1913. A single plant came in a pot, and this was divided up into about half a dozen pieces, which were repotted and grown for a few months in a greenhouse. They were then planted out in the collection of Bamboos near the Rhododendron Dell where they have grown luxuriantly and promise to be as ornamental as any hardy species. They are at present (October 1920) about 8 ft. high forming dense masses of culms, the outer ones of which arch outwards towards the top and give the plants a very graceful appearance. In growth *A. Murielae* resembles *A. nitida*, Mitford, more closely than any other hardy species in cultivation, but the culms are stouter and the leaves larger. Moreover, Mr. E. H. Wilson, who collected and first introduced it to cultivation, informs me that the old culms are rich yellow; in *A. nitida* they are purple-black. On the whole *A. Murielae* is a distinct and most attractive addition to hardy bamboos.

W. J. Bean.

LV.—NOTES ON THE BALSAMS OF CHITRAL AND THE KACHIN HILLS.

By the late Major S. M. Toppin, R.A., M.C.

In a previous number (*Kew Bull.*, 1918, 156), the bequest to Kew was announced of a large collection of Indian plants in accordance with the will of Major Toppin. The excellent set of *Impatiens* which it included, accompanied by typewritten descriptive notes by himself and coloured sketches was specially noted. These proved to be of great value and as they were almost ready for publication the following paper has been arranged with such few additions as were necessary by Mr. S. T. Dunn, B.A., Assistant for India in the Herbarium. The paper is followed by some extracts from Sir Joseph Hooker's letters to Major Toppin on the subject of his *Impatiens* collections.

Fertilization of Burmese Impatiens.

For the purpose of discussing the fertilization of the Balsams found in Burma, I have divided the species up into three main groups according to the relative positions of the different portions of the flower—

(1) The vexillum and alae patent and in such position to each other as to close the lip.

(2) Mouth of the lip fully open owing to the divergent positions of the lobes (distal) of the alae which are contorted over each other.

Group (1). The two species of this group have very elongated spurs and I have never seen any insect enter a flower. In neither is there an auricular lobe. I think that most probably this group is fertilized by moths at night.

Group (2). Except in the single case of *I. cymbifera*, Hook. f., all the species of this group have extremely developed auricular lobes. All noticed are visited by butterflies and bees during daytime. The action is as follows:—The butterfly alights directly upon the auricular lobes thus getting a purchase, and at the same time has its body forced up against the pollen owing to the height of the lobes. If the lobes did not exist, the insect in many species could crawl directly into the mouth and rob the honey without coming into touch with the anthers. Further, it may be noticed that in all species the lobes are bright orange, a very distinctive colour as compared with the remainder of the flower, so as to attract the butterfly.

Group (3). Here the mouth is closed by the contorted wings and all species are devoid of auricular lobes. These species also are visited at day by butterflies and bees. Auricular lobes, if present, would be hidden by the contorted wings. The flowers are however smaller as in *I. graciliflora*, Hook. f. and I. *drepanophora*, Hook. f. and many more, and the insect, in actually forcing its way into the mouth, is driven against the anthers.

Dehiscence of the Capsules of Burmese Impatiens.

In dividing the *Impatiens* of Burma into the main sections:

(*a*) species with a short turgid capsule and
(*b*) species with a linear or clavate capsule,

the writer has found that in the species collected by him in Burma (some 25) there is also a most profound difference both in the character of the tissue of the capsule itself and also in the method by which the ripe seeds are ejected, and these two differences group themselves without a single exception in exact accordance with the above sections.

Section (*a*). The entire capsule is composed of thick glistening elastic tissue, and the seeds are distributed throughout the entire length of the pod.

The method of dehiscing consists of two quite distinct motions, and is as follows:—(1) The capsule opens only along one suture commencing at the centre, and the dehiscence spreading at an equal rate towards both the apex and the base till it is entirely opened. (2) The seeds are now rapidly ejected by the upper half of the capsule folding down over the lower half.

Section (*b*). Only the lower portion of the capsule is composed of thick glistening elastic tissue, and this is devoid of seeds; the upper portion is merely a thin membranous bag with no elastic property, and its only use is as a receptacle for the seeds. The

method of dehiscence is as follows:—The capsule splits at the base along all its five sutures at once and the several elastic portions roll up towards the apex, the motion being so rapid that when the limit of the elastic half of the capsule has been reached the membranous portion is torn to pieces and the seeds are thrown out. It will be noticed that here there is only one motion.

It would appear probable that in those species in which the bag is at the base and the elastic portion is at the apex it would be found that the action would be similar except for the fact that the sutures would all split first at the apex and the several portions would coil inwards and downwards instead of outwards and upwards, but no actual species of this kind have been collected in Burma by the writer although, no doubt, they are common. To such an extent is the distribution of the seeds dependent on the tearing to pieces of the membranous bag by the force of the elastic half, that if the capsule is held at the juncture of these two tissues till the force of the elastic portion is expended and then released, it will be found that the bag containing the seeds has lost all power of splitting up and ejecting them.

List arranged as in Sir J. D. Hooker's Epitome (Rec. Bot. Surv. Ind. iv. 1).

1.—Species of the Western Himalaya.

§ 1.

1. **I. Balsamina,** *L.;* Almora. *Toppin* 3444.

§ 2.

2. **I. Roylei,** *Walp.;* Gilgit, 1909, *Toppin* 1035 (in part).

I. Roylei, Walp.—Fig. 1, lateral sepal; 2, sepal with spur; 3, standard; 4, wing.*

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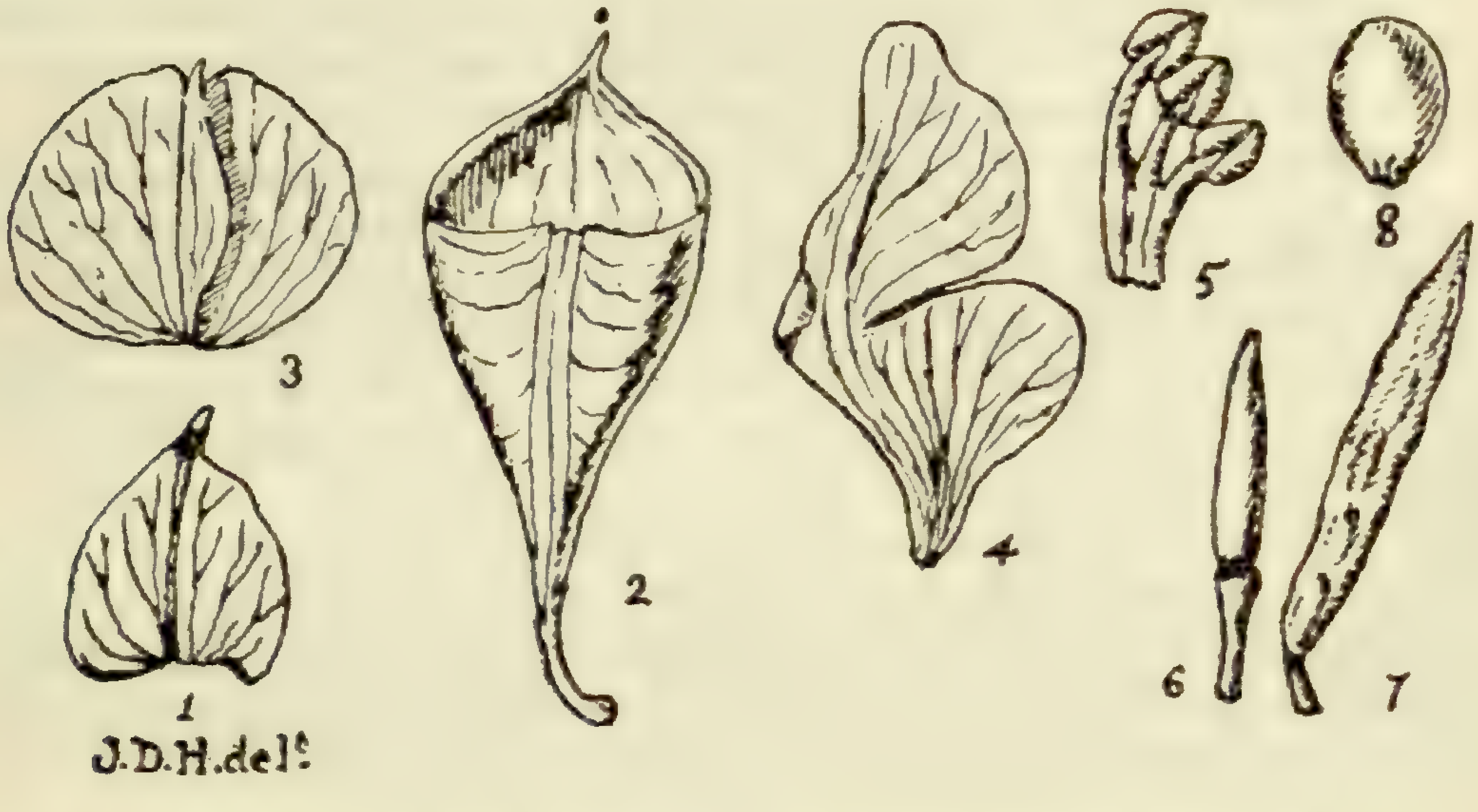
* In making the drawings for this paper Miss Smith wishes it to be noted how greatly she has been helped by Major Toppin's beautifully selected and dried dissections. It would have been impossible in some cases to understand the flowers without them. Sir J. D. Hooker was much handicapped in his work on *Impatiens* by want of dissections properly prepared in the field.

The help of various artists is acknowledged at the foot of the drawings when their work has been used.

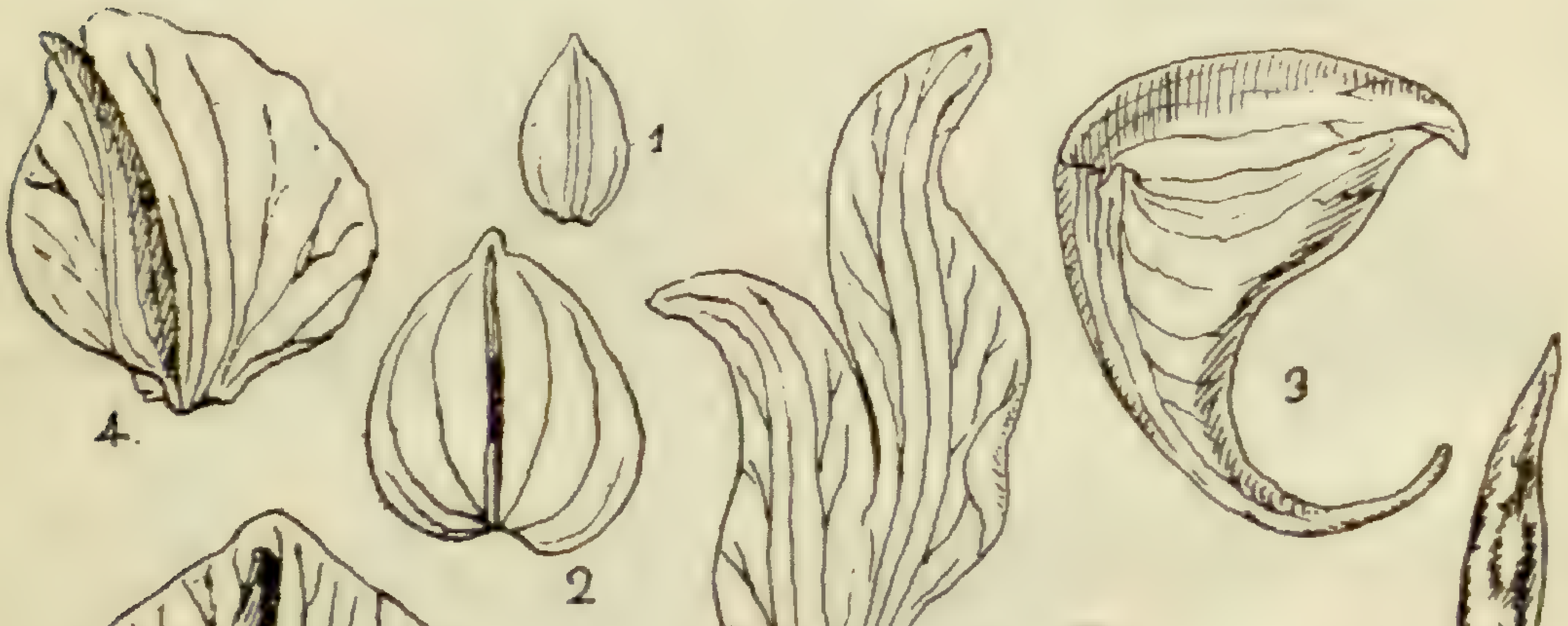
8. **I. Lemanni,** *Hook. f. & Thoms.;* abundant in Chitral from 1220–2740 m.



I. Lemanni, Hook. f. & Thoms.—Fig, 1, lateral sepal; 2, spurred sepal; 3, standard; 4, wing; 5, stamens; 6, ovary; 7, capsule; 8, seed.

13. **I. Edgworthii,** *Hook. f.* var. **Toppinii,** *Hook. f.* MS. var. foliis verticillatis.

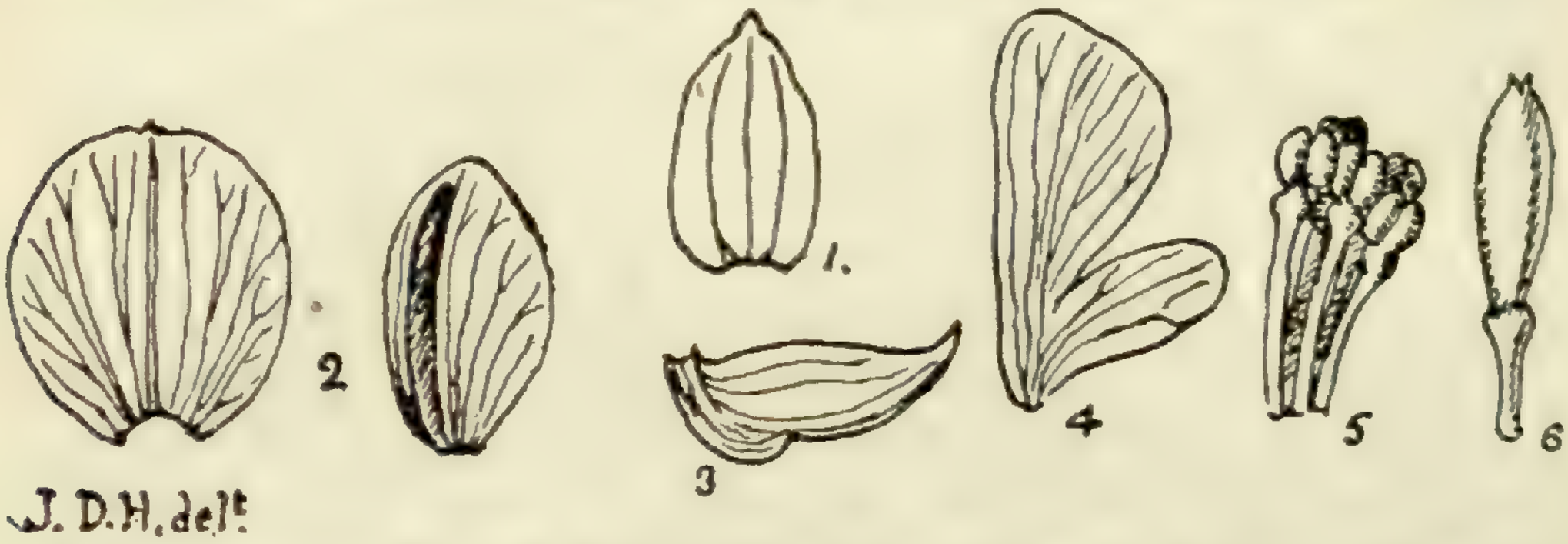
Chitral: Ziarat; 2300–2700 m., Aug. 1908, *Toppin* 605.



I. Edgworthii, Hook. f. var. *Toppinii*, Hook. f.—Fig. 1, bract; 2, lateral sepal; 3, spurred sepal; 4. standard; 5, wing; 6, stamen; 7, capsule; 8, seed.

§ 3.

17. **I. brachycentra,** *Kar. & Ker.;* Chitral, Lowari Pass at 2700 m., June and July, flowers white, *Toppin* 405.



I. brachycentra, Kar. & Ker.—Fig. **1**, lateral sepal; **2**, spurred sepal; **3**, standard; **4**, wing; **5**, stamens; **6**, capsule.

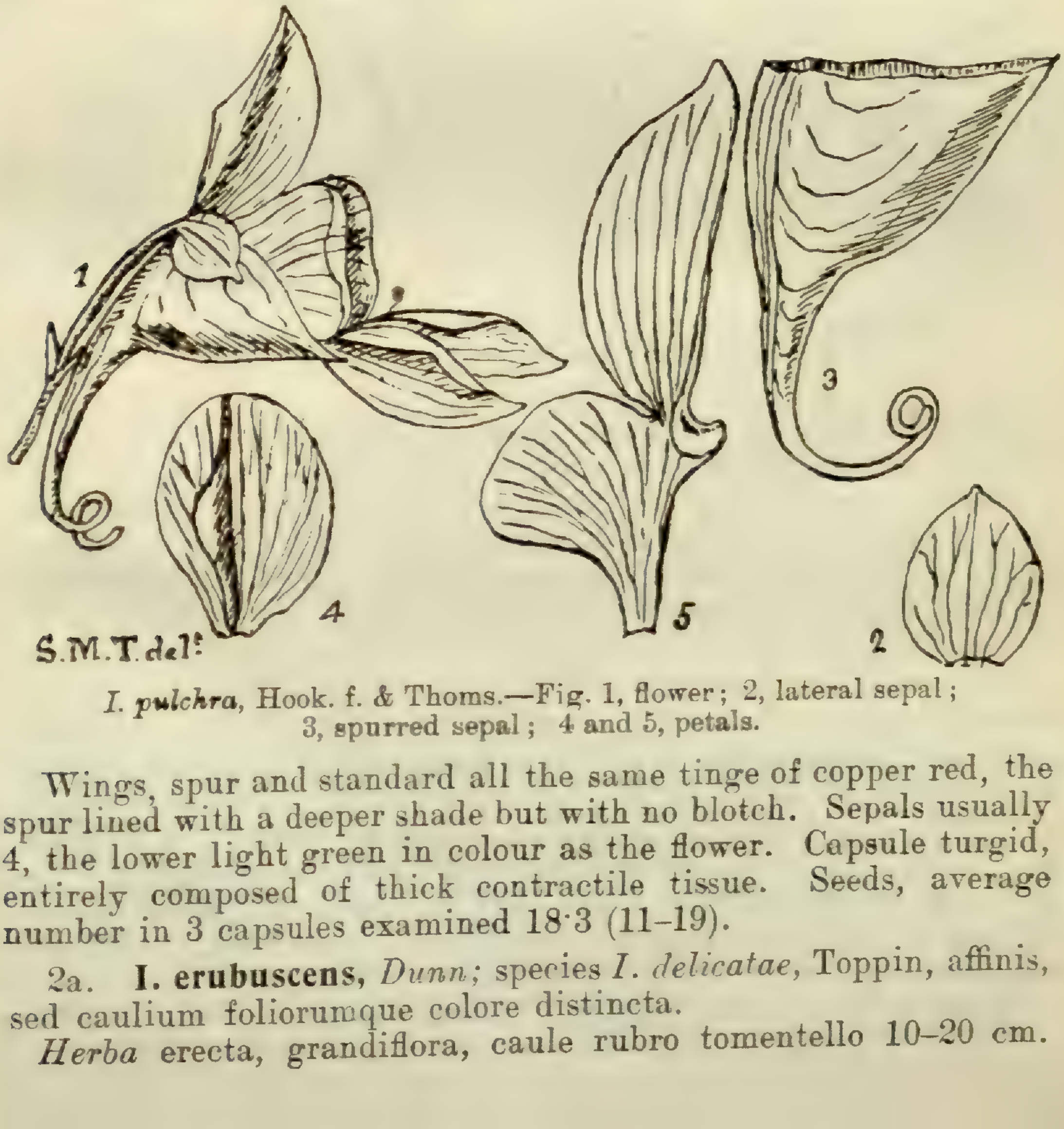
§ 5.

20. **I. cristata,** *Wall.;* Wight Ic. t. 323. Western Himalaya, Almora at 1220 m., *Toppin* 3446.

III.—Species of the Burmese Region.

§ 2.

2. **I. pulchra,** *Hook. f. & Thoms.;* Kachin Hills, Warao Hka, growing in sunny positions at 470 m., the roots clinging to the face of the damp rocks. Dec. 1911. *Toppin* 4242; also at Sinlum at 1300 m. *Toppin* 2747.



I. pulchra, Hook. f. & Thoms.—Fig. 1, flower; 2, lateral sepal; 3, spurred sepal; 4 and 5, petals.

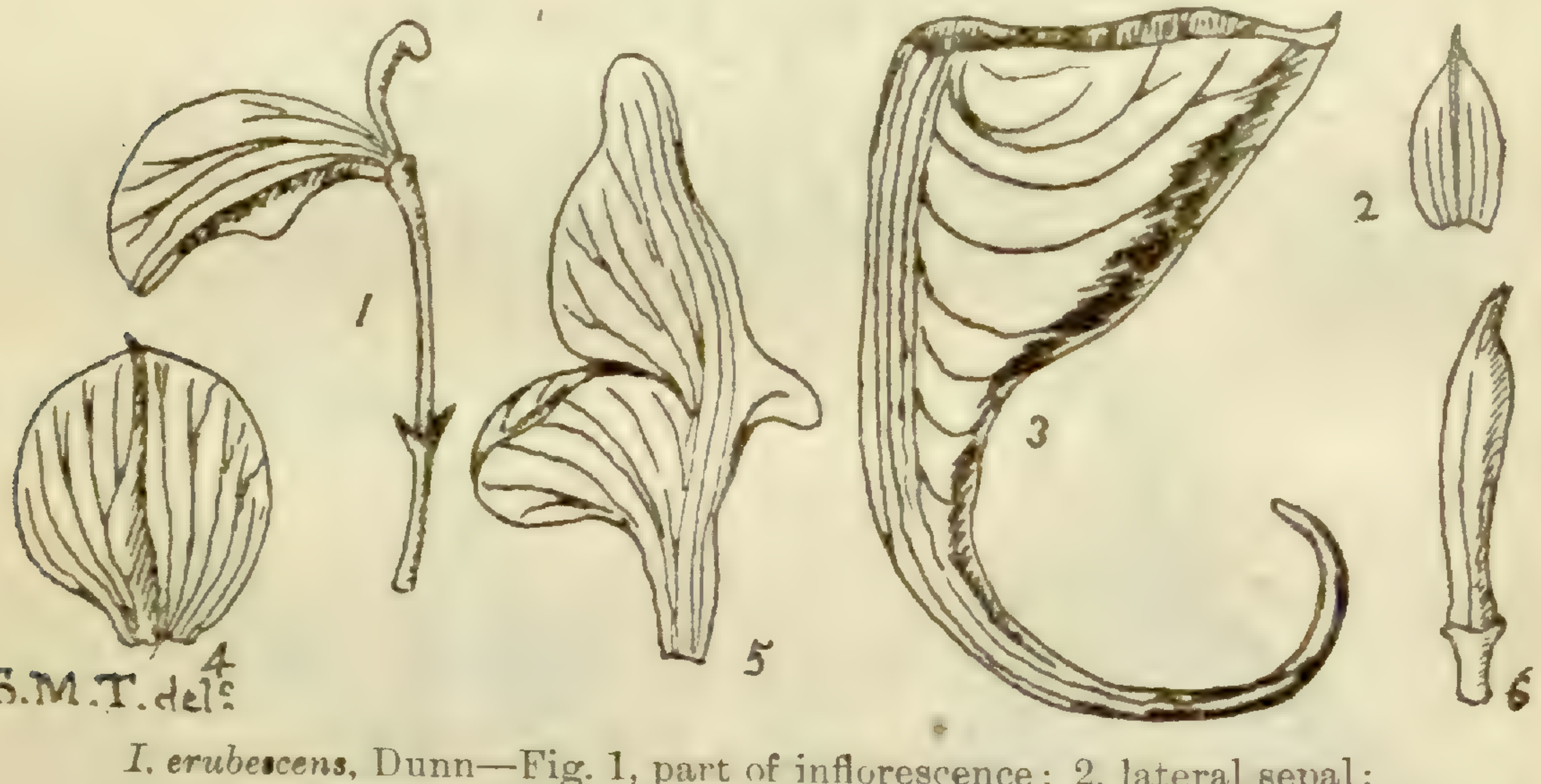
Wings, spur and standard all the same tinge of copper red, the spur lined with a deeper shade but with no blotch. Sepals usually 4, the lower light green in colour as the flower. Capsule turgid, entirely composed of thick contractile tissue. Seeds, average number in 3 capsules examined 18·3 (11–19).

2a. **I. erubuscens,** *Dunn;* species *I. delicatae*, Toppin, affinis, sed caulium foliorumque colore distincta.

Herba erecta, grandiflora, caule rubro tomentello 10–20 cm.

alto simplice superne folioso. *Folia* alterna, lanceolata, apice basique acuta, 4–7 cm. longa, 1·5–2·5 cm. lata, dentibus apiculatis concinne crenata, apiculis in grandulas longe stipitatas basi gradientibus, subglabra, supra atro-viridia, subtus pallide rubra, nervis rubris 5–6-paribus; petioli 0·5–1·5 cm. longi. *Pedunculi* ex axillis superioribus 1–3-flori, 2–6 cm. longi; bracteae lineares, 3 mm. longae. *Flores*, calcare incluso, ad 4 cm. longi rosei; pedicelli 1–1·5 cm. longi. *Sepala* 2 lateralia ovato-lanceolata, acuminata, 8 mm. longa, 5–6-nervia, tenuissima; posticum ex ore cymbiformi 2·5 cm. lato 8 mm. alto in calcar tenue semi-circulare 3 cm. longum abiens. *Vexillum* orbiculare, ad 1 cm. diametro; costa dorso medio breviter carinata. *Alae* 2·5–3 cm. longae, basi cuneatae; lobus basalis late oblongus; distalis longior, obtusus; auricula dorsalis conspicua, flava. *Filamenta* 7 mm. longa; antherae connatae. *Capsula* glabra, turgida, 1·5 cm. longa. *Semina* circiter 45.

Kachin Hills. Kao Hka gorge: in crevices on the face of cliffs; 550 m., January 1912, *Toppin* 4362.



I. erubescens, Dunn—Fig. 1, part of inflorescence; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing; 6, pistil.

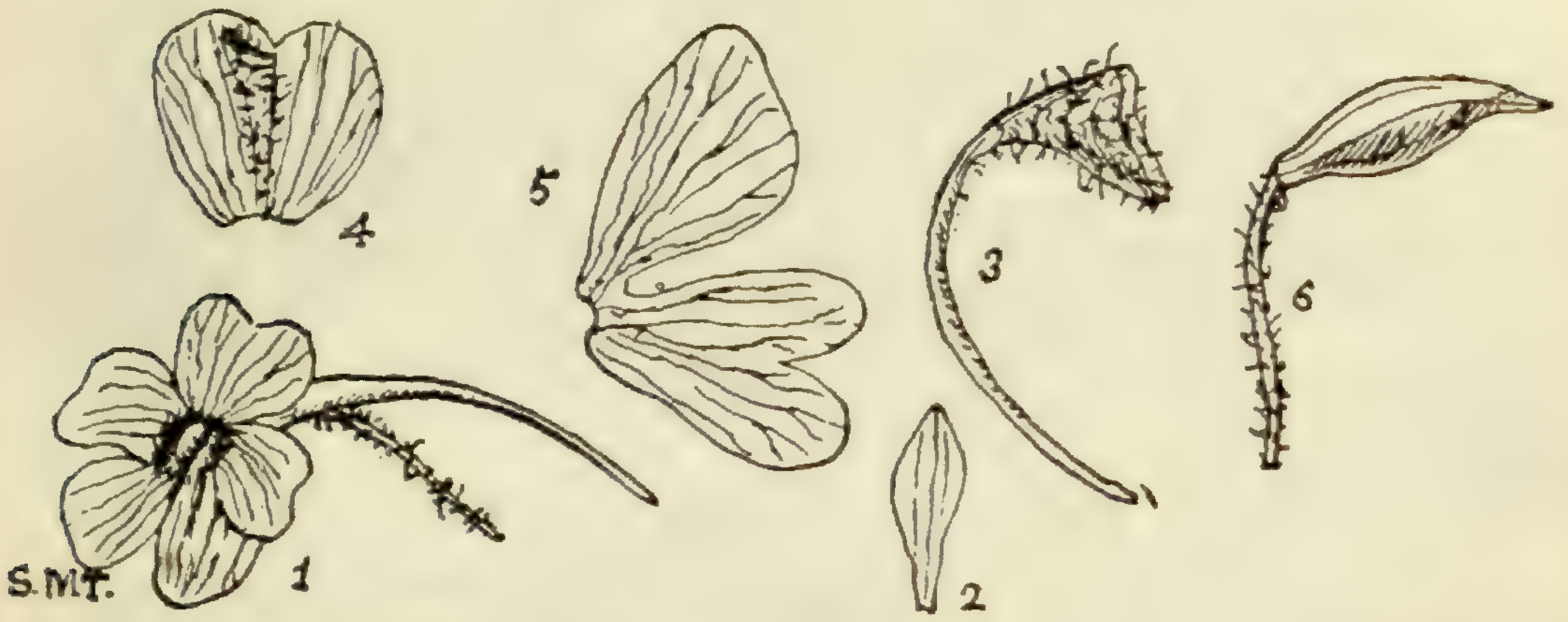
2b. **I. delicata,** *Toppin;* species *I. pulchrae*, Hook. f. & Thoms., affinis, sed foliorum nervis 4–5-paribus distincta.

Herba ascendens, glaberrima, gracilis, 8–12 cm. alta, caule brevi. *Folia* alterna, lanceolata, crenata, subtus pallida, 3–5 cm. longa, in petiolum 1 cm. longum angustata, nervis utrinque 4–5; glandulae stipulares nullae. *Pedunculi* 2 cm. longi, uniflori vel biflori, foliis breviores; pedicelli 1–1·5 cm. longi, inferiores basi, superiores altius bracteati; bracteae parvae. *Flores* ad 3·5 cm. expansi, rosei. *Sepala* 2 lateralia rosea, ovato-lanceolata vel lanceolata, acuminata, ad 1 cm. longa; labelli limbus cymbiformis, roseus, in calcar 3 cm. longum fere rectum attenuatus, ore ad 2 cm. longo horizontali. *Vexillum* roseum, orbiculare, ad 13 mm. diametro; costa dorso medio breviter carinata. *Alae* ad 3 cm. longae, roseae; lobus basalis rotundatus; lobus distalis oblongus; auricula dorsalis conspicua, roseo-flava. *Capsulae* turgidae.

Kachin Hills. Sumprang; 420 m., 30.12.11, *Toppin* 4287.

I. delicata, Toppin—Fig. 1, whole flower; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing; 6, pistil.

9. **I. violaeflora,** *Hook. f.;* Kachin Hills, Sinlum, 1370–1520 m., *Toppin* 2679.

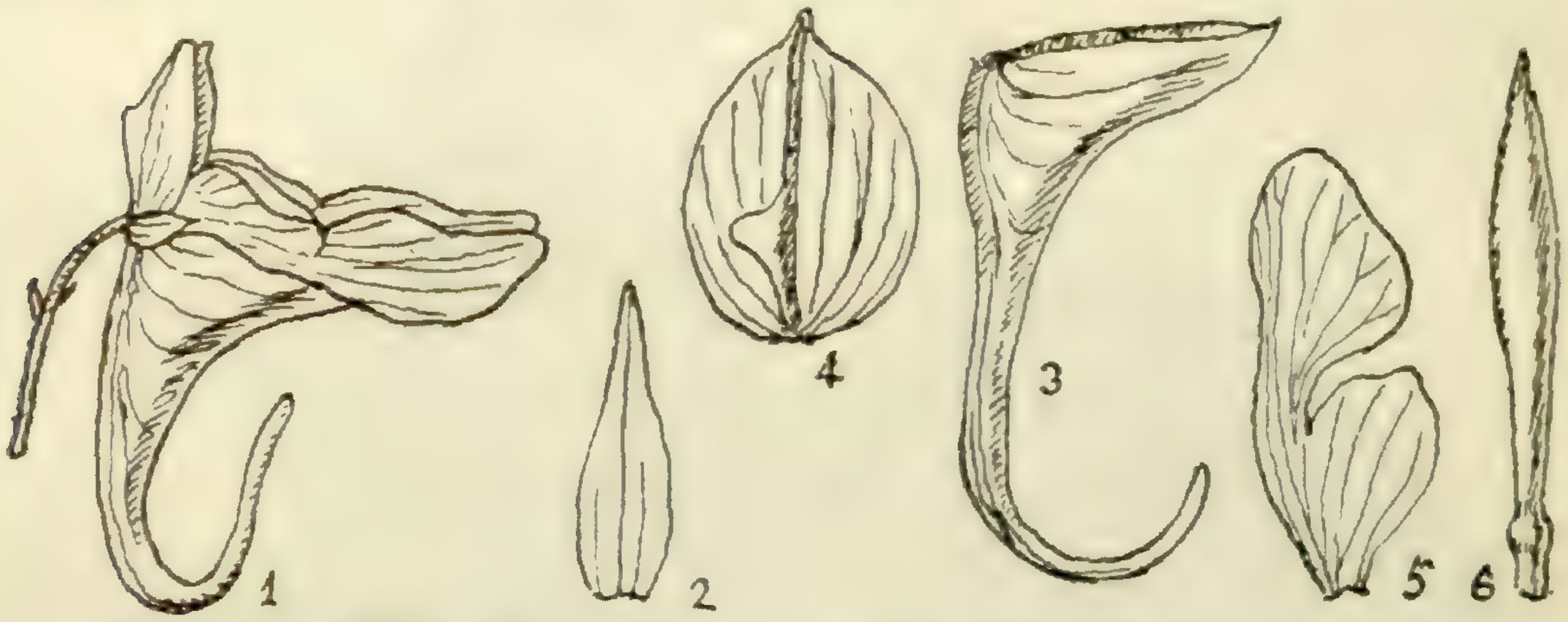


I. violaeflora, Hook. f.—Fig. 1, flower; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing; 6, capsule.

An erect branched and hairy plant 15–45 cm. in height. *Stem* glabrous or slightly hairy on the upper portion, not swollen at the nodes. *Stipular glands* and stipules nil. *Leaves* alternate, crowded at the top of the stem, ovate-lanceolate, covered with white scattered hairs and with distinctive red hairs on the margins of the lower half up to 5 mm. in length. *Inflorescence* axillary, crowded and pedicelled from the upper leaf axils. Bracts minute, lanceolate, at base of pedicels. Fruiting pedicels decurved. *Flowers* rotate, deep rose in colour, reverse side of the petals being of much lighter tinge, 2 cm. in diameter. *Sepals* 2, minute. *Lip* glabrous or with a few soft hairs. The *spur* very slender up to 3·25 cm. in length, nearly straight. *Wings*, the two lobes subequal with no dorsal auricle but a yellow spot marking the position. *Standard* notched, with a slender keel, broadly cordate. *Pollen* light pink. *Pod* turgid in the centre, covered with white hairs. When ripe the line of cleavage is longitudinal, commencing from the centre of the pod which is entirely composed of thick glistening contractile tissue; when the pod has split in length it contracts on itself transversely thus ejecting the seeds. *Seeds* dark brown, rough, with no hairs when ripe, but covered with white tomentum when green. The number depends largely on the nature of the ground. Collected on the hard roadside, the average number in 10 capsules was 6·5 (6–8). Collected in boggy ground the average number in 5 examined was 12·6 (10–17). This plant is extremely variable in size and appearance but the distinctive length of the spur and the usually long red hairs on the margins of the leaves seem to be constant features.

13. **I. porrecta,** *Wall.;* N.E. Burma: Ngau Hka at 500 m.; Kao Hka gorge at 550 m.; in wet jungle but in full sunshine, Jan. 1912, *Toppin* 4359.

A delicate plant up to 45 cm. high. *Stipules* and stipular glands nil. *Flower* orange yellow. *Sepals* 2, tinged with yellow and green. The lip and standard slightly spotted with crimson.



I. porrecta, Wall.—Fig. 1, flower; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing; 6, pistil.

Auricular lobes nil. The mouth of the lip nearly closed by the contorted wings: spur slightly curved. *Standard* with blunt keel. *Capsule* glabrous and turgid. *Seeds* globose, glabrous; average number in 2 capsules examined was 2·5. This plant is completely glabrous and thus is in accordance with the description in the *Flora of British India*.

13a. **I. Toppinii,** *Dunn;* species *I. porrectae*, Wall., affinis, sed floribus intense rubro-purpureis sepali postici ore cymbiformi distincta.

Herba procumbens, radicum fasciculos, pedunculos et folia ex nodis caulis et ramorum repentium teretium tomentosorum emittens. *Folia* alterna, ovata, apice basique acuta vel breviter acuminata, 4–6 cm. longa, 2–3 cm. lata, serrata dentibus parvis crebris apiculatis, utrinque hirtula, nervis 7–8-paribus; petioli 1–2 cm. longi. *Pedunculi* 1–2-flori, 1·5–4 cm. longi; pedicelli 1–3 cm. longi, medio bractea lanceolata 5 mm. longa instructi. *Flores* calcare curvato incluso 3 cm. longi, intense rubro-purpurei. *Sepala* puberula; 2 lateralia oblongo-lanceolata, acuminata, 1–1·5 cm. longa, rubro-brunnea, 3–5 nervia; posticum ex ore cymbiformi 1·5–2 cm. lato superne apiculato in calcar tenue semicirculare 2·5 cm. longum abiens. *Vexillum* orbiculare, ad 1 cm. diametro, dorso pubescens, breviter gibbum. *Alae* glabrae, basi cuneatae, 2·5–3·5 cm. longae; lobus basalis superne rotundatus; distalis longior, oblongus, obtusus; auricula dorsalis conspicua, flava. *Capsula* turgida, glabra. *Semina* 8, glanduloso-rugosa, fusco-brunnea.

Kachin Hills. Sinlum; at 1500–1800 m., June and July, 1911, *Toppin* 2781.

The dedication of this balsam to the memory of Major Toppin, who worked with such perseverance and success at the elucidation of the genus on the N.W. and N.E. frontiers of India, and who soon afterwards gave his life in the Great War in defence of the Empire, will be approved by all. It fulfils, moreover, one of the

I. Toppinii, Dunn—Fig. 1, lateral sepal; 2, spurred sepal; 3, standard; 4, wing; 5, capsule.

I. kamtilongensis, Toppin—Fig. 1, lateral sepal; 2, spurred sepal; 3, standard; 4, wing; 5, capsule.

last wishes of the greatest authority on *Impatiens*, for Sir J. D. Hooker had selected a species among the Chitral Balsams to be called after Major Toppin, but on Aug. 2, 1911, wrote to him saying that after all it was not new, being *I. Lemanni*, Hook. f. & Thoms., "you will, I hope," he added, "make up for the loss by finding a new species in Burma."

This plant is one of the commonest as well as one of the most beautiful balsams in the Kachin Hills. The Latin diagnosis has been drawn up from the discoverer's own English description.

14a. **I. kamtilongensis,** *Toppin;* species *I. khasianae*, Hook. f., affinis, sed floris colore distat.

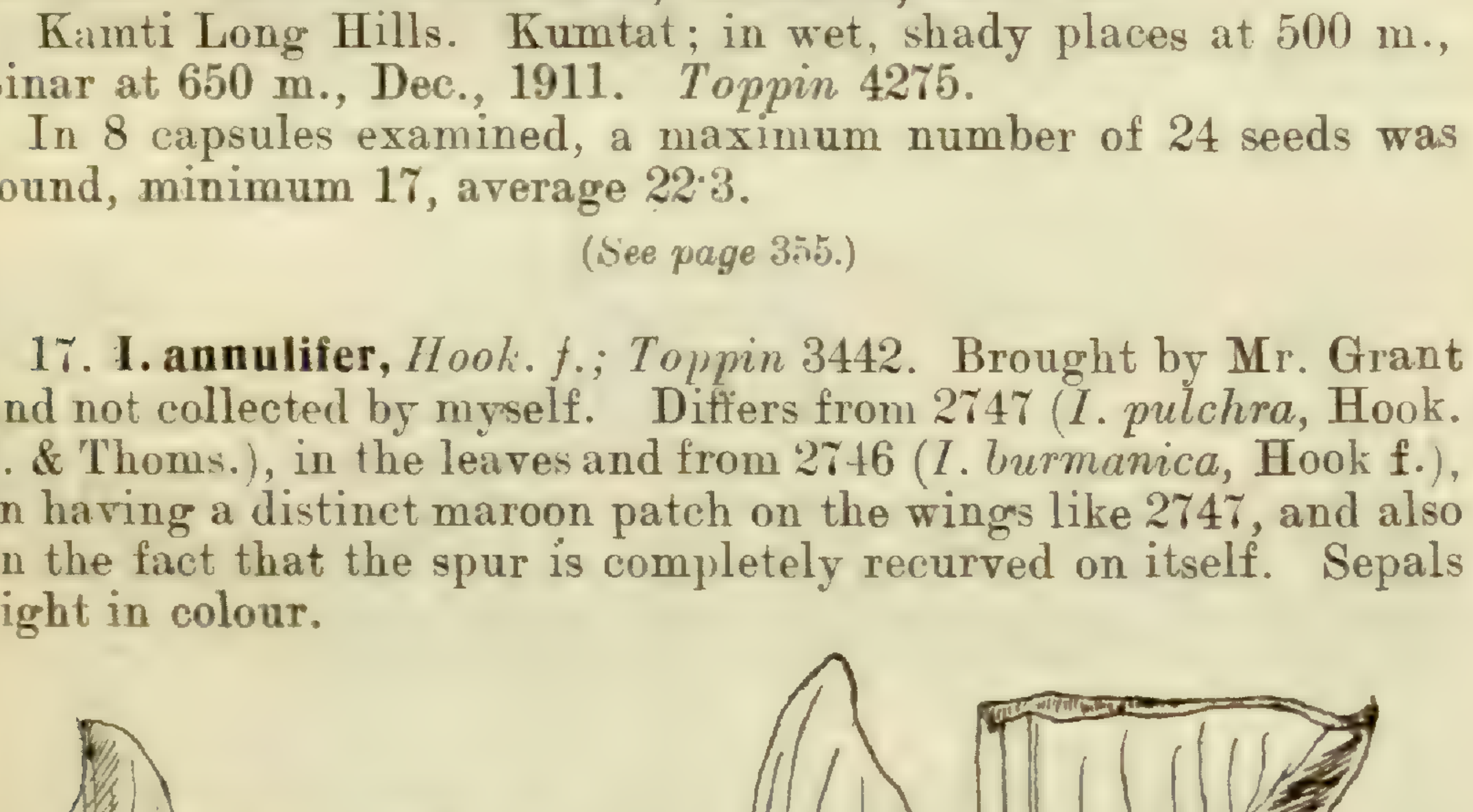
Herba erecta, pilis fuscis hirsuta, ad 30 cm. alta, caule succulento. *Folia* ovata vel ovato-lanceolata, crenata, acuminata, subtus pallida, petiolata, nervis utrinque 7–8; glandulae stipulares nullae. *Pedunculi* 2 cm. longi, hirsuti, biflori, foliis breviores. *Pedicelli* 1–1·5 cm. longi. basi bracteati; bracteae lineares. *Flores* pallide sufflavi vel fere albi. *Sepala* lateralia 2, ovato-lanceolata, acuminata, ad 10 cm. longa, hirsuta; labelli limbus hirsutus, cymbiformis, in calcar incurvum ad 1·25 cm. longum attenuatus, ore 1 cm. longo horizontali. *Vexilli* costa dorso in medio cornuta. *Alae* 2 cm. longae; lobus basalis rotundatus, lobus distalis oblongus; auricula dorsalis conspicua. *Capsulae* turgidae, hirsutae. *Semina* orbicularia, atrofusca, circa 22.

Kamti Long Hills. Kumtat; in wet, shady places at 500 m., Sinar at 650 m., Dec., 1911. *Toppin* 4275.

In 8 capsules examined, a maximum number of 24 seeds was found, minimum 17, average 22·3.

(*See page* 355.)

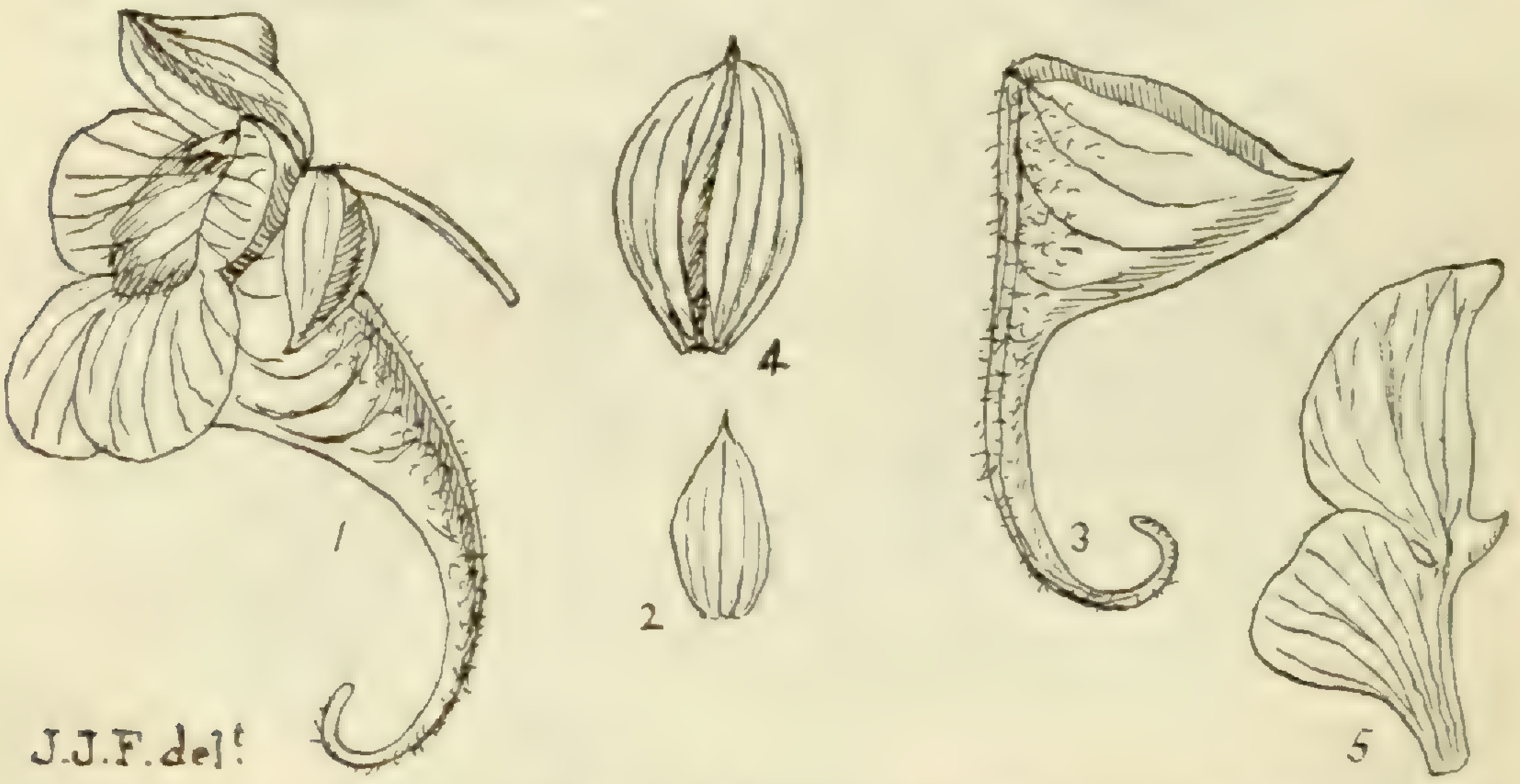
17. **I. annulifer,** *Hook. f.; Toppin* 3442. Brought by Mr. Grant and not collected by myself. Differs from 2747 (*I. pulchra*, Hook. f. & Thoms.), in the leaves and from 2746 (*I. burmanica*, Hook f.), in having a distinct maroon patch on the wings like 2747, and also in the fact that the spur is completely recurved on itself. Sepals light in colour.



I. annulifer, Hook. f.—Fig. 1, flower; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing.

Mr. Rae has seen this specimen, and also 2746 (*I. burmanica*, Hook. f.), when growing, and states that they are very different in appearance. Mr. Grant's description of colour is "Flower yellow and claret, spur yellow with brown stripes, outer wings buff, turning to yellow at base with stripes of claret and maroon, standard yellow and deep claret."

18. **I. burmanica,** *Hook. f.;* Kachin Hills, 500 m. (Kumtat), 400 m. (Pungyi), 1300 m. (Sinlum), *Toppin* 2746.



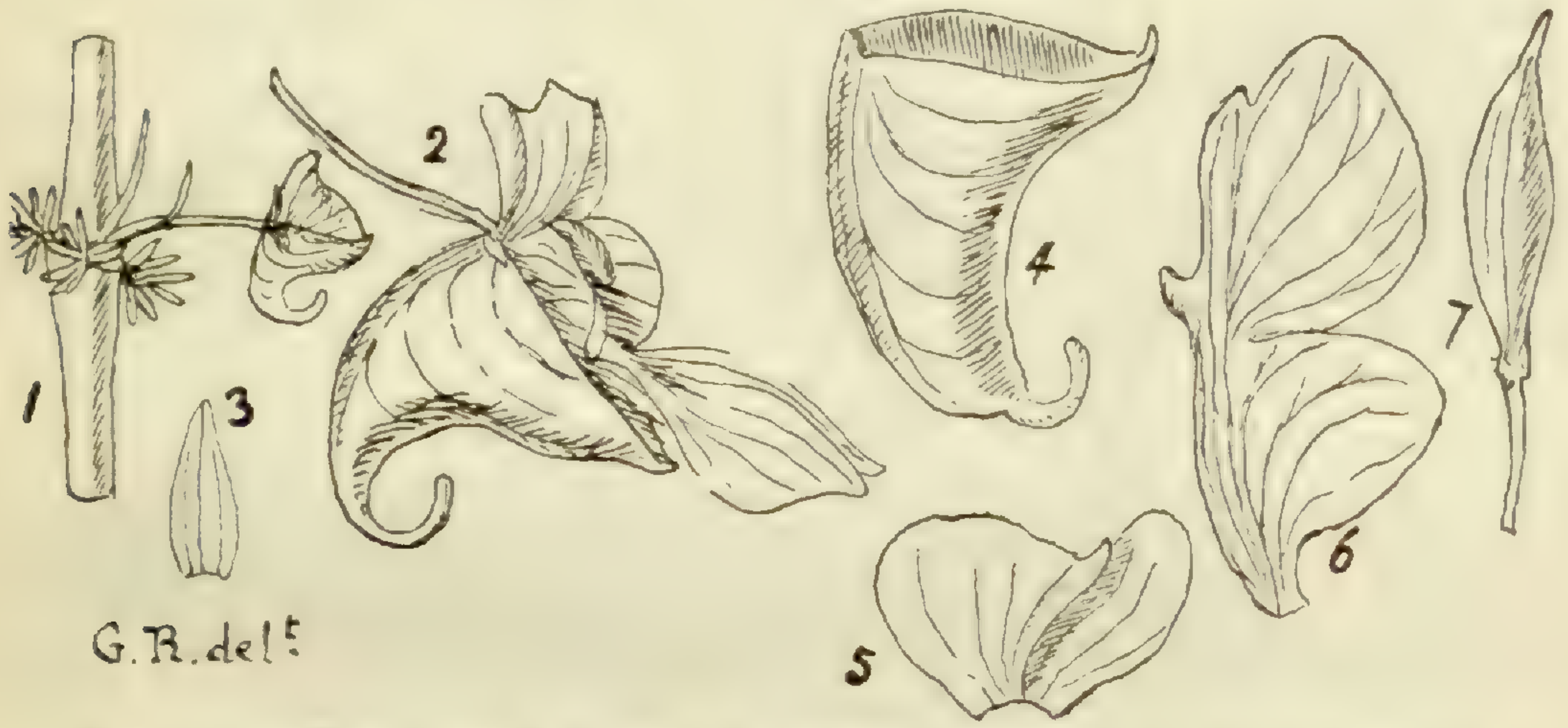
I. burmanica, Hook. f.—Fig. 1, flower; 2, lateral sepal; 3, spurred sepal; 4, standard; 5, wing.

On 29–9–11 I spent a night at Palong Gatung, below Sinlum, to attempt to settle the question of the separate identity of this species and the previous one (3442). I took up Mr. I. I. Fagan, who is an expert artist, and his painting (now at Kew), may be taken as an exact reproduction of the flower. I examined with care 43 different specimens, picking in each case a plant with a fully developed flower and also a bud. It grows invariably in water, and is not even found in the very close jungle and ground near to the water's edge. In no case was there any stipule nor any stipular gland. In every case the bract was found at the base of the pedicel. In no case was there any variation in the auricular lobes nor in their colour. In every case the spur was curled round, but in no case with a fully open flower was it recurved completely on itself. The sepals were extremely variable in colour, from greenish to deep red, but in no case were they pure green. I only found one case in which there were four sepals, although I found more than this the first time when examining fewer flowers. In no case had the wings the distinctive deep maroon markings that were invariably found in 3442 at the base, and in only two cases they were not pure cream without, viz.: (1) The inner edge of the wings had a bar of deep orange red running along it, and also a distinctive bar of the same colour running from the base to the outer edge. (2) In this flower one wing had the above marking, but not the other. I

examined 7 pods only; seeds 33–60; average in the pods were 45·6.

This plant is very local here, I only found it in one stream, and in this for only the distance of about a mile when it ceased, although if I had searched for it for a longer time I might have found it further afield. I searched other streams but did not find it, and the Kachin with me told me that it grew nowhere else. It only grew in deep shade.

25. **I. tripetala,** *Roxb.;* Hills east of Bhamo at 1500–1700 m., June and July, in shady places by roadsides and banks of streams. *Toppin* 2680.



I. tripetala, Roxb.—Fig. 1, bud; 2, flower; 3, lateral sepal; 4, spurred sepal; 5, standard; 6, wing; 7, capsule.

A stout erect glabrous *herb* or slightly pubescent and branched, 1–1·2 m. high. *Stem* glabrous or covered with a few scattered hairs, swollen at the nodes, succulent. *Leaves* ovate or ovate-lanceolate, acuminate at the end, slightly crenate, 10–13 cm. long exclusive of the petiole, which is 1·2 cm. in length; petiole with 6–12 glands on each side of the base. *Pedicels* springing from the axils of the leaves. *Flower* 2·5 cm. in length, reddish purple in colour. *Sepals* 2, lanceolate. *Lip* with an acuminate tip on the lower margin of the mouth, suddenly constricted to form the small curved spur. *Standard* orbicular, keeled. *Wings* with rounded lateral lobes and with a well marked yellow ear-shaped lobule. *Pollen* white. *Capsule* turgid. Average number of *seeds* found in 12 capsules was 21·8 (16–33); unripe seeds covered with white tomentum.

The distinctive points of this flower are (1) the rapidly constricted spur and (2) large number of stipular glands.

25. **I. tripetala,** *Roxb.* var. **microscypha,** *Hook. f.;* Sinlum, Kachin Hills, 700 m., Aug., Sept. *Toppin* 2779.

An erect herb 30–45 cm. high. Stipular glands on each side of the leaf. *Flowers* bright light red-purple. *Bracts* at the base of the pedicel. *Capsule* turgid and entirely composed of thick glistening substance. *Seeds* brown in colour; average number found in 5 capsules 16 (9–24).

I examined 27 different plants and found no variation in (1) number of sepals (2) colour and size of the auricles, but I found great variation in the colour of the sepals, some being bright green and others of the same colour as the flower.

28. **I. chinensis,** *L.;* Fyson, Fl. Pulney Hills, ii. 49. Bot. Mag. t. 4631. N.E. Burma, Lweje at 1000 m., in the water-courses between the fields. *Toppin* 2780.

Except at the extremity, the spur is distinctly broad in most specimens. This is sometimes found with pure white flowers instead of the usual bright pink.

38a. **I. Pritchardii,** *Toppin;* species *I. laevigatae*, Wall., affinis, sed pubescentia coloreque florum distat.

Herba erecta, pubescentia, robusta, 8–10 cm. alta, cauli succulento. *Folia* ovato-lanceolata, acuminata, serrata, 10–13 cm. longa, alterna, in petiolum 4–5 cm. longum angustata, nervis utrinque 8–10; glandulae stipulares nullae. *Inflorescentia* pedunculata, pedunculis bifloris; pedicelli 1·5–2 cm. longi, inferiore basi, superiore altius bracteato; bracteae lanceolatae, 5 mm. longae. *Flores* expansi, ad 3 cm. diametro. *Sepala* lateralia 2, obliqua, ovato-acuminata, 1·2 cm. longa, 3-vel 5-nervia, fere alba; labelli limbus rubro-flavus, cymbiformis, in calcar incurvum 1·5 cm. longum attenuatus, ore 2 cm. longo horizontali. *Vexillum* orbiculare vel ellipticum, ad 1·5 cm. diametro, pubescens, purpureum; costa dorso carinata. *Alae* ad 3 cm. longae, purpureae; lobus basalis rotundatus, lobus distalis oblongus; auricula dorsalis conspicua. *Filamenta* 5 mm. longa. *Capsulae* turgidae, 3 cm. longae. *Semina* circa 15, fusca.

Kachin Hills, Wasi, at 170 m., in damp shady places, 12.12.1911. *Toppin* 4093.

(*See page* 360.)

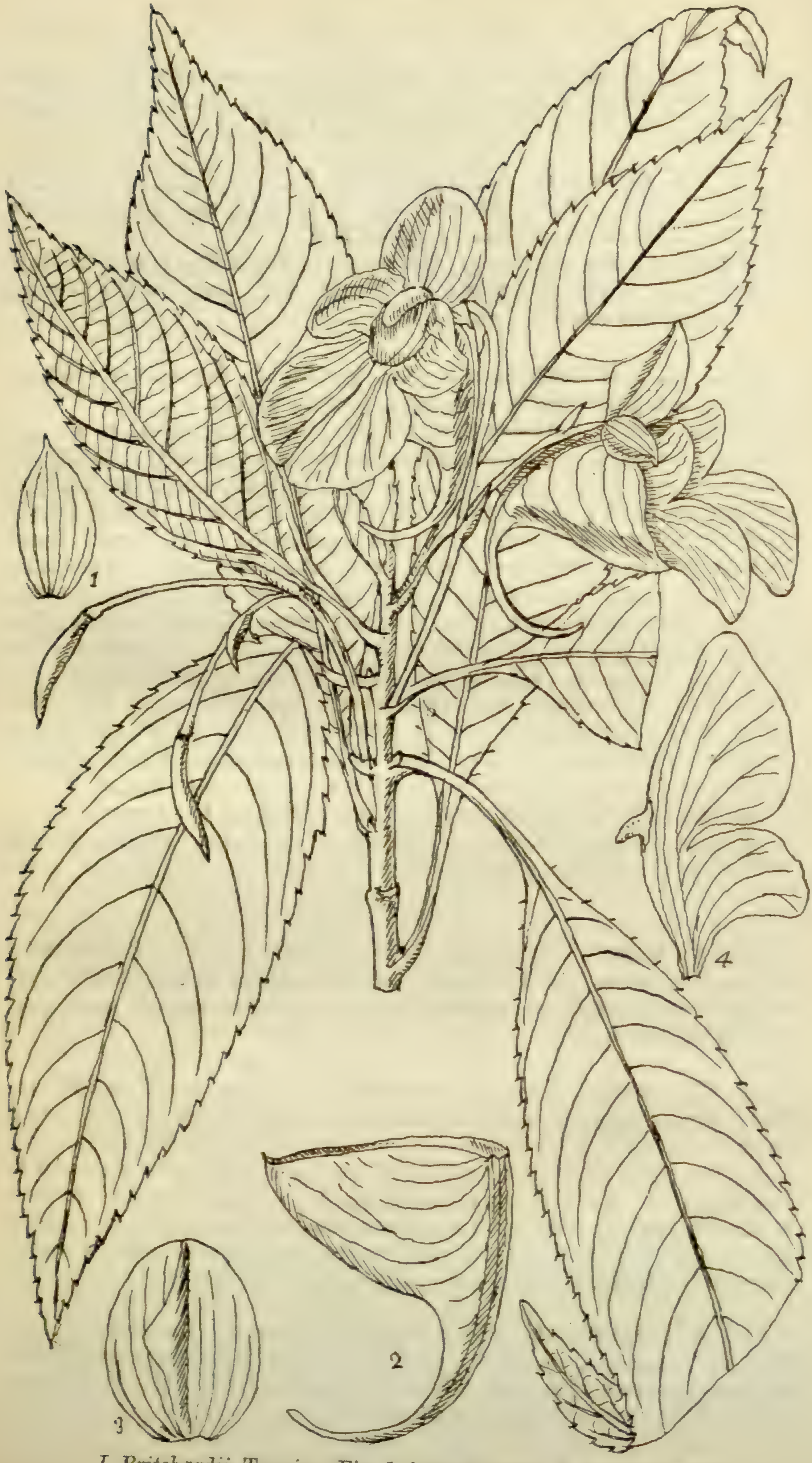
40. **I. arguta,** *Hook. f. & Thoms.;* Hook. Ic. Pl. t. 2875 (var.). N.E. Burma at 800–1700 m. Lateral sepals and standard red, wings lilac, labellum mottled with the same colour and spur yellowish brown.

43. **I. Jurpia,** *Ham.;* Kachin Hills, Sinlum, at 2170–2300 m. Only found in very wet and absolutely shady places. Aug. and Sept. *Toppin* 2745.

A very stout and erect herb 1–1·2 m. high. Stipular glands nil. *Bracts* green, half way up the pedicels. *Flower* white, flushed with rose and spotted with a deeper shade. *Sepals* 2, pure white in colour. *Wings* divergent, forming a well-defined open mouth. This is the finest balsam seen up to date.

43. **I. rubrolineata,** *Hook. f.;* N.E. Burma. Common in the Kachin country towards Kampti Long and further East in the Khunnong area, Kumtat 500 m. Naogang 500 m., Nja Hka 430 m. January. *Toppin* 4300, 6034.

(*See page* 361.)



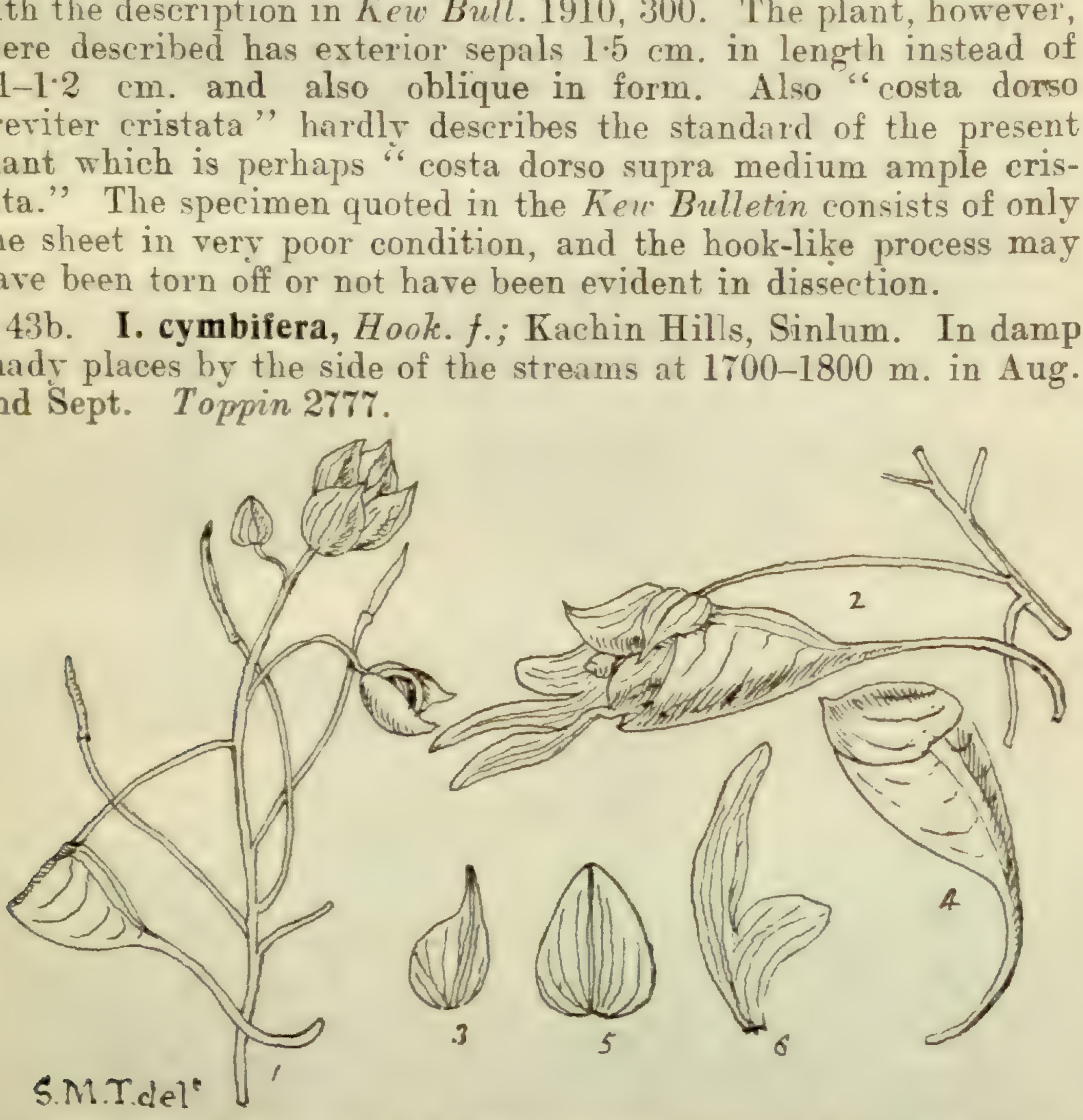
I. Pritchardii, Toppin—Fig. 1, lateral sepal; 2, spurred sepal; 3, standard; 4, wing.

I. rubrolineata, Hook. f.—Fig. 1, lateral sepal; 2, spurred sepal; 3, standard; 4 wing. (Interior sepals not shown.)

A stout erect glabrous plant 0·6–1 m. high. *Leaves* alternate, ovate-lanceolate, glabrous and dark green. Stipules and stipular glands nil. Petioles 2–3 cm. in length with 3 or 4 pairs of glands. *Pedicels* in whorls of 5 or 6, springing from a common peduncle which arises from the upper leaf axils. Length of the pedicels 1–2 cm. Length of peduncles 5 cm. *Bracts* ovate or ovate-lanceolate, at the base of the pedicels. *Flower* light lemon, striated with pink and sometimes with a few dark green blotches on the standard. *Sepals* 4, the exterior ovate, the interior very elongate, 2 cm. long and nearly colourless, with a peculiar hook-like process at the apex. *Lip* broadly open. *Spur* blunt, curved. *Wings* 4 cm. long; dorsal auricles well developed; lobes large. *Standard* with a characteristic large blunt keel. *Pod* glabrous, elongate and only containing seeds in the upper half, 4–5 cm. in length. *Seeds* glabrous; average number in 18 pods examined 5·8 (3–7).

This plant may later have to be separated from *I. rubrolineata*, Hook. f. There is no dried specimen of the plant at Kew, but only a drawing of an incomplete specimen collected at Manipur. This drawing does not show the most distinctive hook-like process on the interior sepal which is characteristic of the specimens described above, but the plant agrees roughly in other respects with the description in *Kew Bull.* 1910, 300. The plant, however, there described has exterior sepals 1·5 cm. in length instead of 1·1–1·2 cm. and also oblique in form. Also "costa dorso breviter cristata" hardly describes the standard of the present plant which is perhaps "costa dorso supra medium ample cristata." The specimen quoted in the *Kew Bulletin* consists of only one sheet in very poor condition, and the hook-like process may have been torn off or not have been evident in dissection.

43b. **I. cymbifera,** *Hook. f.;* Kachin Hills, Sinlum. In damp shady places by the side of the streams at 1700–1800 m. in Aug. and Sept. *Toppin* 2777.



I. cymbifera, Hook. f.—Fig. 1, part of inflorescence; 2, flower; 3, lateral sepal; 4, spurred sepal; 5, standard; 6, wing.

An erect glabrous, stout and branched *herb* 1–2 m. high. *Stem* groved, nodes prominent and sometimes rufous in colour. *Leaves* ovate-lanceolate, crenate, 10–13 cm. exclusive of the petiole which is 1·25–2·5 cm. long. Two stipular glands at the base of the petiole. *Racemes* simple, springing from the axils of the leaves, 10–13 cm. long; the pedicels 1–2 cm. in length, alternate from the peduncle. *Bracts* caducous, large, white, completely protecting the young flower. *Sepals* 2, ovate, cordate, acuminate, mauve in colour. *Corolla* 3·5 cm. in length, dirty mauve in colour, blotched with yellow and dark purple. *Standard* orbicular, without keel. *Wings* with lateral lobes rounded, the terminal narrow with no dilatation or depression on the margin. *Lip* with a slightly curved slender spur. *Pollen* pinkish-mauve in colour. *Capsule* linear. *Seeds* glabrous, average number found in 5 capsules 9·8.

Fertilised by bees. This is most interesting to me for it is the first species collected in these parts that has large caducous bracts that are of sufficient size to protect the flower while in bud, and it is a distinct link between the groups into which I have divided the majority of the genus in this range. It possesses the typical open mouth of the one group, while at the same time it has no auricular lobe and its capsule is clavate.

47a. **I. porphyrea,** *Toppin;* species *I. stenanthae,* Hook. f., affinis, sed bracteis persistentibus et floribus purpureis distincta.

Herba erecta, ramosa, glabra, 1–2 m. alta. *Caulis* in nodis turgidulus, striatus. *Folia* ovata vel lanceolata, 7–10 cm. longa, arcte crenata; petioli 0·5–1 cm. longi, basi duobus glandulis setiformibus stipularibus ornati. *Flores* 2·5 cm. longi, porphyrei, in racemis terminalibus vel rarius axillaribus pedunculatis ad 8 cm. longis dispositi; pedicelli ad 2 cm. longi, bracteis persistentibus concavis coloratis suffulti. *Sepala* lateralia lanceolata, 8 mm. longa, viridia vel colorata; posticum infundibuliforme, superne cornutum; calcar paullo curvatum, extremitata turgido. *Vexillum* orbiculare, obtuse calcaratum. *Alae* lobi laterales rotundati, terminales acutissime elongati margine integri. *Capsula* linearis.

Kachin Hills. Sinlum; 2200–2300 m., in sunny situations near the top of one hill only, on which it grows in dense patches. *Toppin* 2744.

The colour of all plants seen was of the same deep claret colour. The mouth of the flower is closed by the convergent terminal lobes of the wings. Bees usually settle on the lip and pierce the extremity, thus robbing the honey.

48. **I. bracteolata,** *Hook. f.;* Hills East of Bhamo, 1500–2300 m. June to July, in sunny moist places and also along shady watercourses. This is the most widely spread species in these hills, *Toppin* 2678.

A slender erect glabrous and branched herb 1 m. high. *Stem* terete, swollen at the nodes and often coloured brown. *Leaves* ovate-lanceolate, crenate, 10–15 cm. long, exclusive of petiole. Petiole 1 cm. in length with two small stipular glands at base. *Racemes* simple, springing from the axils of the leaves, 10–12 cm.

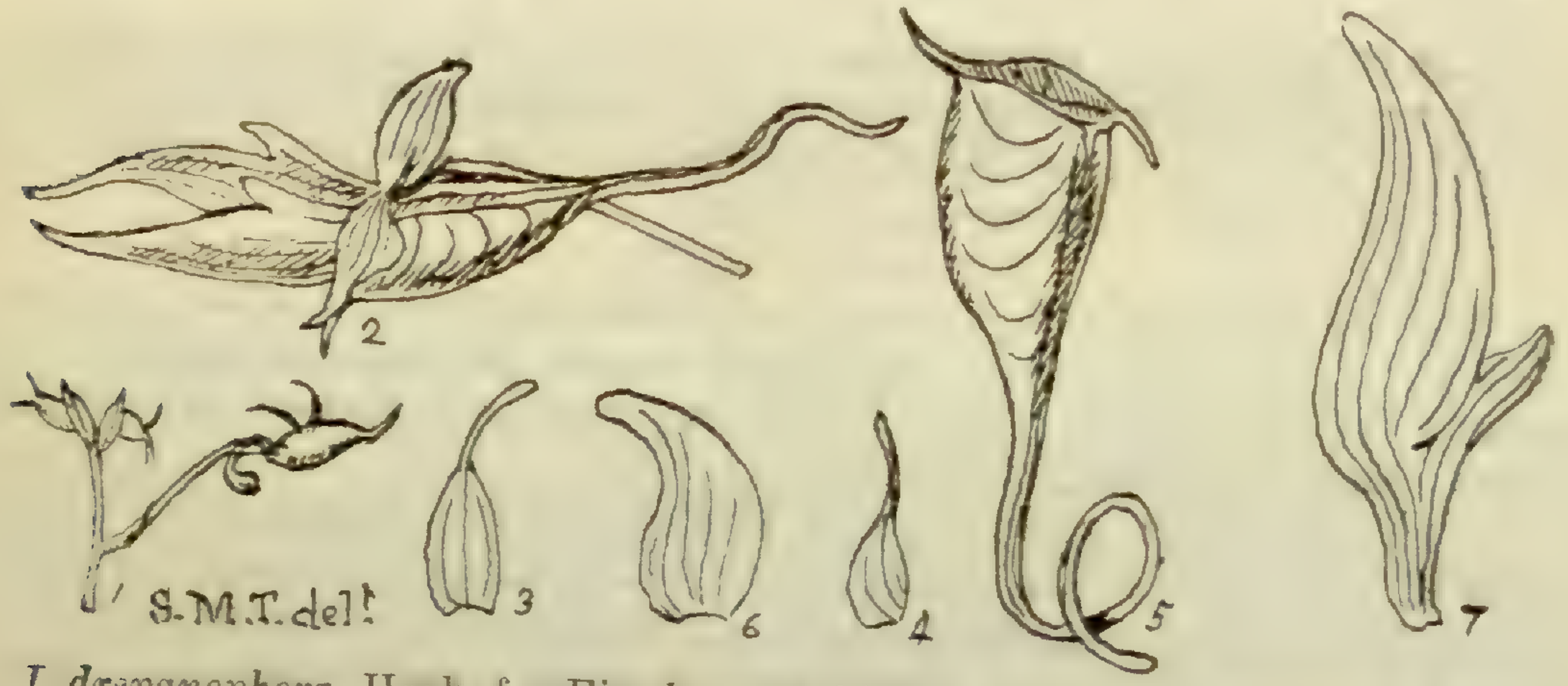
long. The pedicels 2 cm. in length. Bracts persistent, small. *Flower* 4 cm. in length, light yellow in colour throughout, with

I. bracteolata, Hook. f.—Fig. 1, axil showing stipular gland; 2, part of inflorescence; 3, outer sepal; 4, inner sepal; 5, spurred sepal; 6, standard; 7, wing.

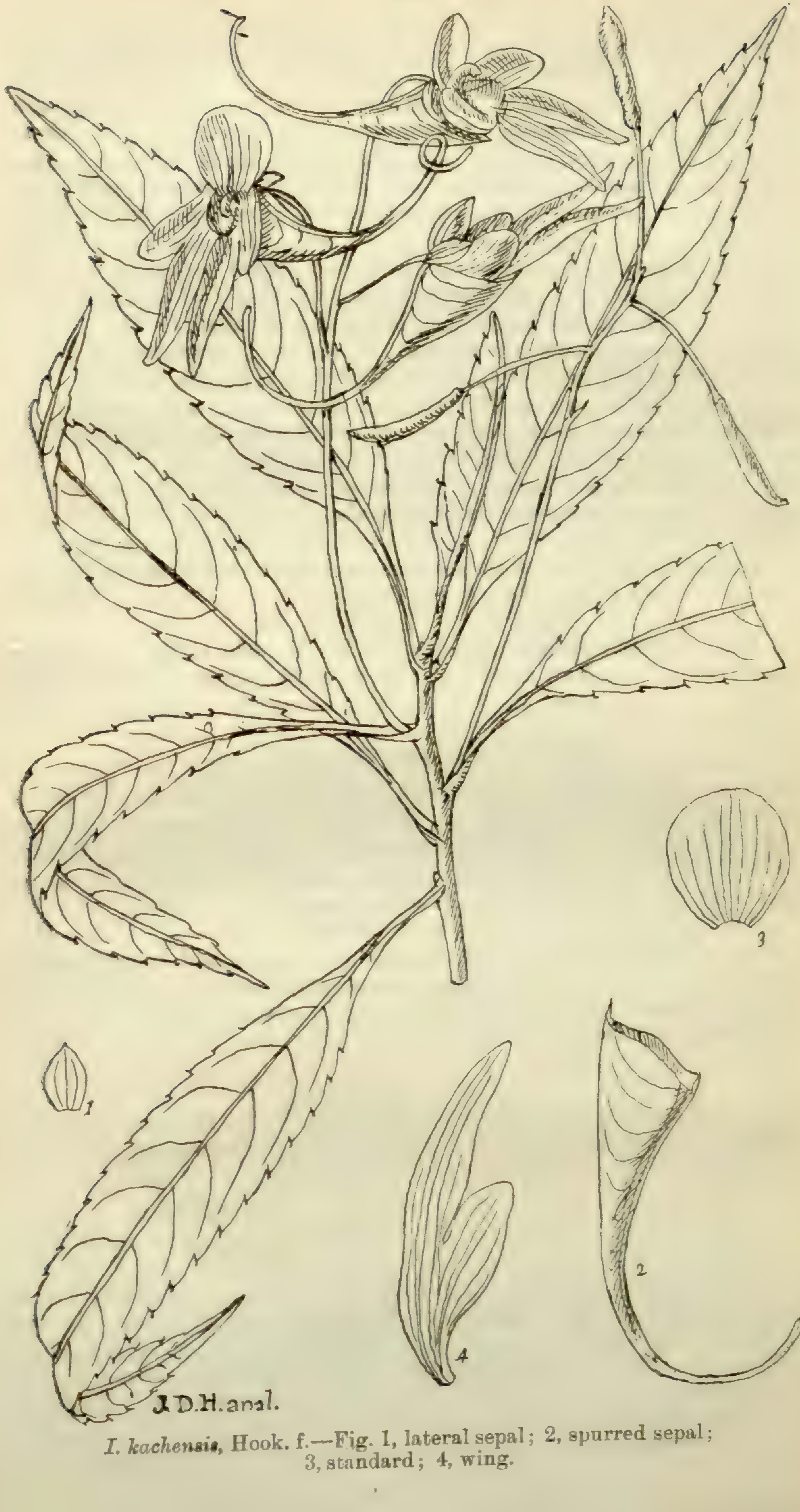
a very contorted appearance. *Sepals* 4, both pairs very small, but one very minute indeed with a dark red spot at the extremity. *Lip* with a long slender straight spur. *Standard* erect or even bent backwards and contorted on itself, not spurred. *Wings* with two narrow lobes, contorted so that the two wings cross each other, the terminal lobe having a pit-like depression on its margin instead of the dilatation. *Pollen* light yellow. *Capsule* linear. *Seeds* only at the apex, dark brown; average number found in 28 capsules examined was 11·8 (9–16).

The distinctive points of this plant are (1) the erect contorted standard, (2) the pit-like depression on the terminal lobes of the wings.

49. **I. drepanophora,** *Hook. f.;* Hills east of Bhamo at 1700–2300 m. Aug.–Sept. In shady places along the watercourses and roadsides. *Toppin* 2778.



I. drepanophora, Hook. f.—Fig. 1, part of inflorescence; 2, flower; 3, bract; 4, lateral sepal; 5, spurred sepal; 5, standard; 7, wing.



I. kachensis, Hook. f.—Fig. 1, lateral sepal; 2, spurred sepal; 3, standard; 4, wing.

A tall erect glabrous and branched herb 1–1·2 m. high. *Stem* terete, only slightly swollen at the light green nodes. *Leaves* ovate-lanceolate, crenate, 10–13 cm. long exclusive of petiole which is 5 cm. in length. Petiole with two small stipular glands at base. *Racemes* simple, springing from axils of the leaves, 10–15 cm. long, the pedicels 2 cm. in length. Bracts caducous, small, ovate-lanceolate, with apiculate tip, green in colour. Bud, excluding spur, ovoid in shape. *Flower* 3·5 cm. in length. Lateral *sepals* 2, uncinate, long awned, light green in colour. *Lip* with long spiral or corkscrew spur, spotted with crimson; the upper margin of the mouth of the lip has a peculiar light green horn. *Standard* yellow-orange in colour, slightly spurred. *Wings* with two narrow lobes slightly spotted with crimson, the terminal lobe having no dilatation or depression on its margin.

The distinctive points of this plant are: (1) the orange yellow colour with crimson spots, (2) the corkscrew shape of the spur, (3) the erect green horn on the upper margin of the mouth of the lip, (4) **the uncinate awned sepals.**

The mouth of the flower is closed by the convergent wings. It is visited by the bees, which often settle on the lip and prick the spur from the outside to rob the honey.

49a. **I. kachinensis,** *Hook. f.* MS.; Kachin Hills, Sumprang at 420 m.; Bum Kan at 470 m.; Kumtat at 480 m. in the shingle bed of streams which during the rains must be many feet under water.

(*See page* 365.)

A semi-erect plant. *Stem* red. Stipular glands red. *Flower* entirely light orange-yellow. Mouth closed by wings. *Wings* long, contorted, and with no auricular lobes. *Capsules* linear, the seeds being in the upper portion only. Seeds gibbous, average number in 16 capsules examined was 12·5 (7–17).

This species is visited at day by butterflies and bees. Auricular lobes if present would be of no avail as they would be hidden by the contorted wings. The flowers are small, as in *I. graciliflora*, Hook. f., and *I. drepanophora*, Hook. f., and many more, and the insect in actually forcing its way into the mouth is driven against the anthers.

Extracts from letters from Sir J. D. Hooker to Major Toppin upon the subject of his Impatiens collections.

The Camp,
near Sunningdale,
August 3, 1910.

My Dear Sir,

You are no doubt aware that Mrs. Toppin has submitted to my inspection the 5 species of Balsam collected by you in the N.W. Himalaya. To my great surprise I at once recognised 4 of those collected in Chitral, to be totally different from any of the upwards of 100 Himalayan kinds known to me. When to this is added the remarkable fact that these most distinct plants are confined to the extreme western limit of the genus in the

Himalaya, their discovery must be regarded as, in a geographic point of view, one of great and singular interest.

August 2, 1911.

In your last letter, 15-1-11, you tell me that you are going to take 3 months' leave this summer and propose confining your attention to a few genera. This will give you time to make careful notes on the plants which you will collect, and such notes will be invaluable.

October 5, 1911.

I have just received your long and very interesting letter from Bhamo, of 2-9-11, for which I most cordially thank you. I do wish I could discuss with you several of the very curious points it indicates, but at my age it is impossible, for I am in my 95th year.

I do fervently hope you will publish your *Impatiens* observations and send them to the *Kew Bulletin*. Above all, do keep the Kew Herbarium supplied with specimens of your discoveries, accompanied with flowers for analysis and your excellent notes. Thank you most truly for the correspondence you have given me, and with every good wish for your professional advancement and career,

Believe me, dear Mr. Toppin,
Most sincerely yours,
Jos. D. Hooker.

LVI.—MISCELLANEOUS NOTES.

Dr. A. F. G. Kerr, Government Medical Officer, Chiengmai, Siam, has been appointed Government Botanist in Siam.

Dr. Kerr has for some years devoted his leisure to a study of the flora of Siam and has sent to Kew extensive collections containing many new species which have been described in the *Kew Bulletin* in "Contributions to the Flora of Siam," by Prof. W. G. Craib. It is a matter for congratulation that Dr. Kerr has now been placed in a position to devote his whole time to the investigation of the comparatively little-known botanical resources of this region.

Mr. W. Small, M.B.E., appointed Botanist in the Department of Agriculture, Uganda, in 1913 (*K.B.*, 1913, 90), has now been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Mycologist in the same Department.

Mr. A. S. Clegg, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Superintendent in Mauritius.

Mr. E. Downes, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent of Public Gardens, Jamaica.

Mr. E. A. Ruck, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant District Agricultural Officer in the Department of Agriculture, Uganda.

Mr. E. A. Hughes, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a gardener in the service of the Government of the Punjab.

Mr. G. H. Fothergill, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a gardener in the service of the Government of Bengal.

Mr. E. A. McCallan, First Agricultural Assistant, Department of Agriculture, Bermuda, has been appointed by the Secretary of State for the Colonies, Director of Agriculture, Bermuda, in succession to Mr. E. J. Wortley (*K.B.*, 1920, 285).

Mr. W. H. Johnson, lately Director of Agriculture, Southern Provinces, Nigeria, who has recently retired on pension from the Colonial Service, has accepted a commission from the Empire Cotton Growing Association to proceed to Queensland and other parts of Australia with reference to cotton growing in that country.

John Reader Jackson.—We record with great regret the death of Mr. J. R. Jackson on October 28th at Lympstone, S. Devon, in his 84th year. Since the year 1914 he had been in indifferent health, but had still been able to enjoy his well-earned rest and devote some time to the subject of Economic Botany in which he had a lifelong interest.

When Mr. Jackson retired from the post of Keeper of the Museums in 1901 a note was published in the *Kew Bulletin* for that year, on p. 201, giving a brief account of his work at Kew. Since his retirement from his official duties, after 43 years' devoted service, Mr. Jackson contributed many articles on Economic Botany to the "Technologist," the "Pharmaceutical Journal," "Gardeners' Chronicle" and other periodicals.

He was born at Knightsbridge in May, 1837, and then lived for several years at Canterbury, where his family went to reside when he was some six years old. The architectural interests of Canterbury appear to have influenced him very strongly and stimulated him with a desire to become an architect, but as this profession did not offer him the prospect of a lucrative position at

the moment he was advised by his friend Prof. Bell to divert his attention to other studies. It was through this friend that he was introduced to Sir William Hooker, Robert Brown, John Lindley, and other eminent men, and in the year 1858 he was put in charge of the Museums at Kew in succession to Alexander Smith, the first Curator.

The Kew Museum collections at that date were only in their earliest stages, and for twenty years Mr. Jackson remained in sole charge. Owing to the growing importance of the collections an assistant, Mr. J. M. Hillier, was appointed in 1879, Mr. Jackson being made Keeper, and on his retirement in 1901 he was succeeded as Keeper by Mr. Hillier.

Among his works may be mentioned the new edition of Barton and Castle's *British Flora Medica* which he edited in 1877, and the *Commercial Botany of the XIX Century* which was published in 1890.

One of his official duties at Kew was to give lectures on Economic Botany to the young gardeners, and the value of his courses of instruction and his keen interest in this work are gratefully remembered by some hundreds of Kewites.

During his long residence in Richmond Mr. Jackson was actively engaged in charitable and educational works connected with St. John's Church, of which he was for many years one of the Wardens. In 1868 Mr. Jackson was elected an Associate of the Linnean Society and at the time of his death was the oldest Associate.

His former colleagues retain the memory of a gentle and unselfish character and a valued friend.

Odoardo Beccari.—It is with very much regret that we have received the announcement of the death at Florence, on October 25th, of Dr. Odoardo Beccari, an old and highly esteemed correspondent of the establishment and a liberal contributor to the Herbarium. Since October, 1869, Kew has been in frequent communication with him, and up till February, 1918, he continued to send dried specimens and drawings, chiefly of Palms, and copies of certain of his publications for the library. For many years he was Director of the Royal Botanic Garden and Museum at Florence. His travels in Malava and New Guinea during which he made large collections of botanical specimens, resulted in the publication, between the years 1877 and 1886, of three quarto volumes, under the title of "Malesia," each containing numerous plates. The second volume of this work includes Beccari's classical study on myrmecophilous plants. A letter from him, dated February 19th, 1888, conveys an acknowledgment of pecuniary help afforded him by the Bentham Trustees towards the cost of the illustrations in this work. A narrative of some portion of his travels appeared in 1902 under the title "Nelle Foreste di Borneo." An English translation of this volume, by Dr. E. H. Gigliolo, with some modifications, was published in London in 1904. For many years past Dr. Beccari devoted his studies chiefly to the Palmae, and published numerous works large and small on the family. Amongst these may

be mentioned "Palmæ del Madagascar" (1912), a large folio volume containing 50 plates, and "Asiatic Palms-Lepidocaryeae" (1908–14), published in the "Annals of the Royal Botanic Garden, Calcutta," vol. xi. and vol. xii. pt. 1; so far he had dealt with the species of *Calamus* and *Daemonorhops*, the former illustrated with 321 and the latter with 111 plates. He contributed several papers to the Italian botanical journals, the more important to "Webbia." Accompanied by Count Martelli, Dr. Beccari spent a few days at Kew in 1908, from July 27th to August 1st. He was elected a Foreign member of the Linnean Society on May 3rd, 1883, at the same time as the late Professor John Lange of Copenhagen. S. A. S.

Reginald Farrer.—Alpine plants and rock gardens have a wide circle of admirers. In this circle a prominent figure was Mr. Reginald John Farrer, the announcement of whose death we have received with profound regret. An enthusiast such as he really was cannot have failed to influence for good those who had come into personal relations with him or had read his books and other writings. Few knew alpines as he did. He had studied them for many years in their native haunts. He had a large-hearted love for all that was beautiful in plant life, and a teeming vocabulary in which to describe the forms and colours and homes of his favourites. Born forty years ago and a native of Yorkshire, as early as 1894 he gave some expression of that interest in alpine vegetation which in later years appeared so dominant by publishing a note in the "Journal of Botany" (p. 344) on the rare *Arenaria gothica*. This he had discovered in another station in the Ingleborough district, where alone it is known in Britain, other than that previously recorded. In 1898 he entered Balliol College, Oxford, as a Commoner. Subsequently he made several tours in the European Alps and published numerous articles on them and the plants he met with in the "Gardeners' Chronicle." These explorations also were the inspiration of the volume "Among the Hills," issued from the press in 1911. In 1903 he undertook a journey round the world, visiting among other places Canada, China and Japan. One outcome of the experiences thus gained was a lecture to the Royal Horticultural Society in May, 1905, on Japanese Plants and Gardens, published in the Society's Journal, vol. xxxi. pp. 12–17. He visited Ceylon in 1907, and spent the years 1914 and 1915 in exploring, in company with Mr. William Purdom, formerly of Kew, the Kansu region of Western China. His work "On the Eaves of the World," published in 1917, is a narrative, in something more than ordinary language, of his wanderings and experiences of the year 1914. A series of articles on his travels in China also appeared in the "Gardeners' Chronicle." Last year another journey to Eastern Asia was undertaken—a journey from which unhappily he was not destined to return, for he fell a victim to diphtheria on October 16th, while travelling on the frontier range between Burma and China. These journeys to the East led to the appearance in cultivation of a considerable

number of choice plants including many novelties. Among them may be mentioned representatives of the following genera, of which new species bear his name:—*Callianthemum*, *Isopyrum*, *Sedum*, *Lonicera*, *Aster*, *Primula*, *Buddleia*, *Gentiana*, *Isometrum*, a new genus of *Gesneraceae*, *Cypripedilum*, *Iris* and *Lilium*. He is also commemorated in *Farreria*, Balf. f. & W. W. Smith, a new genus of *Thymelaeaceae*. Most of the above and other new plants discovered by him are described in the "Notes from the Royal Botanic Garden, Edinburgh." Mr. Farrer's own descriptions of many of his plants appear in his "Report on work in 1914 in Kansu and Tibet" published in the "Journal of the Royal Horticultural Society," vol. xlii. pp. 47–114. In addition to works on fiction and those already specified Farrer wrote "My Rock Garden" (1907), "Alpines and Bog Plants" (1908), "In a Yorkshire Garden" (1909), "The Rock Garden" (Present-Day Gardening Series), and "The English Rock Garden," the last, consisting of over 1000 pages and 102 plates, published in 1919. Many of Mr. Farrer's introductions may be seen at Kew, and numerous others will no doubt yet appear in these and other gardens to procure which he made so many sacrifices, even the sacrifice of a life so largely abounding in those qualities and possessions that render it desirable and beautiful. Appreciations of Mr. Farrer, with a portrait, appear in the "Gardeners' Chronicle" of November 20th. S. A. S.

Miss M. L. Moxon's Alpine Flower Studies.—The collections of the Royal Botanic Gardens, Kew, have been enriched by a very valuable bequest by the late Miss Margaret Louisa Moxon, of the Hazels, New Milton, Hants, consisting of about 1000 water colour drawings of Swiss wild flowers painted during her many visits to Switzerland.

The collection is a remarkably representative series of studies of the flora of the Alps both of the high mountains and of the lower meadows and pastures. The drawings are executed with great artistic skill and scientific accuracy and each study is of great beauty. The collection is contained in seven large portfolios. In the case of the larger subjects only a single species is figured on a sheet but with the smaller plants from the high Alps three or more species may be represented on one sheet. but kept quite distinct and separate.

Some of the plants have been carefully named but owing to Miss Moxon's untimely death the exact determinations had not been completed, nor, unfortunately, had she fully achieved her object of painting the whole of the Swiss alpine flora.

The drawings will be placed in the Herbarium and kept as a separate collection available for study by students as soon as a catalogue has been completed.

Mr. A. E. Moxon, the only surviving brother of the artist, has very generously offered to help to defray the cost of preparing a catalogue; we are also indebted to him for the following particulars of his family and of Miss Moxon's life work.

"Margaret Louisa Moxon, the only daughter of James Edward

and Louisa Sarah Moxon, was born in London on Sept. 30th, 1863.

"There can be no doubt that she inherited her love of nature and talent for drawing from her Huguenot ancestors who after the Revocation of the Edict of Nantes fled to Norwich and settled there for many generations. It was not until 1904 that she paid her first visit to Switzerland, also visiting Italy and Sicily. While at Axenfels she was struck by the wealth of flowers on the alpine pastures but had never received any instruction in flower painting. She started a series of flower studies of that district and finding her interest growing began to make the collection now given to Kew.

"In 1907, 1912 and 1913 other trips were made in search of fresh subjects for her brush but it was always the higher alpines that interested her most. But for the outbreak of the war it was her intention to settle out there and make a complete collection of the Swiss flora. She always said the most difficult flower (Swiss) to paint was *Astrantia major*.

"She died on July 11th in her 57th year and was buried in Milton Churchyard."

Polypodiopsis, *Carrière.*—In his Traité Général des Conifères, ed. 2, p. 710 (1867), Carrière described as *Polypodiopsis Muellerii* what he took to be a new genus of *Coniferae*. This was duly recorded in the Index Kewensis, but otherwise appears to have been overlooked by systematic botanists, not being mentioned by either Bentham and Hooker or by Engler and Prantl. Even Pilger in his monograph of *Taxaceae* for the Pflanzenreich has taken no heed of it. The name is mentioned, however, by Coulter and Chamberlain in their Morphology of Gymnosperms, p. 313 (1910). In speaking of the distribution of Tribe *Taxineae* they remark "The New Caledonian representation is so small, and the affinities of *Polypodiopsis* are so uncertain, that the tribe may be regarded as northern in its distribution, in contrast with the southern distribution of the podocarps."

In reply to an enquiry from Kew, Professor H. Lecomte states that there is no trace of Carrière's specimen amongst the New Caledonian *Coniferae* preserved in the Paris Museum, and at the same time very kindly suggested that the specimen described by Carrière might be one of the *Proteaceae*. Following up this, I find amongst the New Caledonian *Proteaceae* one genus and species, *Bauprea Balansae*, Brongn. & Gris, which agrees exactly with Carrière's description. Carrière mentioned the general similarity of his *Polypodiopsis* with the genus *Phyllocladus*, a genuine member of the *Taxaceae*, and *Bauprea* shows this resemblance very closely.

J. H.

Flora Capensis.—The issue of Parts II. and III. of the second section of Vol. V. of this work, edited by Sir W. T. Thiselton-Dyer, should be recorded. Part II. (pp. 193–384), which was issued in Oct. 1915, continues the analysis of

Santalaceae by Dr. A. W. Hill, which is followed by the *Balanophoraceae* by Mr. C. H. Wright. *Euphorbiaceae*, for which Sir D. Prain, Mr. N. E. Brown and Mr. J. Hutchinson are responsible, occupies the rest of this Part, and extends almost to the end of Part III. (pp. 385–528) which was published in May, 1920. Part III. also includes *Ulmaceae* and concludes with the 3rd species of *Ficus* in *Moraceae*.

Flora of Tropical Africa.—Since the last notice of this work appeared (*Kew Bull.* 1913, p. 283) six more parts have been published as follows:—

Vol. vi. Sect 2, pt. 1, pp. 1–192		(Mar. 1916).
,, ix. pt. 1, pp. 1–192		(Mar. 1917).
,, vi. Sect. 2, pt. 2, pp. 193–359		(Feb. 1918).
,, ix. pt. 2, pp. 193–384		(Apr. 1918).
,, ix. pt. 3, pp. 385–576		(July 1919).
,, ix. pt. 4, pp. 577–760		(July 1920).

Volume vi. Sect. 2, pts. 1 and 2, deals with the remainder of the *Monochlamydeae* and with the Gymnosperms, the following families being described:—*Ulmaceae*, **Barbeyaceae*, *Cannabinaceae* (by A. B. Rendle), *Moraceae* (by A. B. Rendle and J. Hutchinson), *Urticaceae* (by A. B. Rendle). *Myricaceae* (by J. Hutchinson), *Casuarineae* (by C. H. Wright), *Salicineae* and *Ceratophylleae* (by S. A. Skan), *Gnetaceae* (by H. H. W. Pearson), *Pinaceae* and *Taxaceae* (by O. Stapf), and the *Cycadaceae* (by D. Prain).

Vol. ix. pts. 1–4, deals with the *Gramineae* (by O. Stapf), of which there are 178 genera arranged in 19 tribes, the 75th genus, *Setaria*, being reached at the end of part four.

Botanical Magazine.—The following plants are figured in the numbers for July, August and September:—*Nuphar polysepalum*, Engelm. (t. 8852), from the mountain lakes of Colorado; *Pleurothallis grandis*, Rolfe (t. 8853), a native of Costa Rica; *Cotoneaster serotina*, Hutchinson (t. 8854), from Western China; *Daphne tangutica*, Maxim. (t. 8855), from Kansu, Western China; *Coelogyne integerrima*, Ames (t. 8856), a native of the Philippines; *Berberis atrocarpa*, C. K. Schneider (t. 8857), from Western Szechuan; *Allium sikkimense*, Baker (t. 8858), from Sikkim; *Sabia latifolia*, Rehd. & Wils. (t. 8859), from China; *Acacia spectabilis*, Cunn. & Benth. (t. 8860), a native of Eastern Australia; *Arisaema Fargesii*, Buchet (t. 8861), from Szechuan and *Stranvaesia salicifolia*, Hutchinson (t. 8862), from China.

Botanical Magazine.—The numbers for October, November and December, 1920, completing Vol. XVI. of the Fourth Series of the magazine contain the following illustrations:—*Verbascum*

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* A new family established by Dr. Rendle on a peculiar North-east African and Arabian plant previously referred by Schweinfurth to the *Urticaceae*.

Blattaria, Linn. var. *grandiflorum*, Turrill (t. 8863), found in a cornfield in Lincolnshire; *Rhododendron strigillosum*, Franch. (t. 8864), from Western China; *Fritillaria pontica*, Wahlenb. (t. 8865), a native of the Orient; *Melaleuca Radula*, Lindl. (t. 8866), a native of Western Australia; *Kniphofia Snowdeni*, C. H. Wright (t. 8867), from Uganda; *Erica sessiliflora*, Linn. f. (t. 8868), a native of South Africa; *Syringa reflexa*, C. K. Schneider (t. 8869), from Central China; *Phlomis spectabilis*, Falc. ex Benth. (t. 8870), a native of the Western Himalaya, Afghanistan and Baluchistan; *Rhododendron Sargentianum*, Rehder & E. H. Wils. (t. 8871), from Szechuan, South-Western China; *Mesembryanthemum dichroum*, Rolfe (t. 8872), from South Africa; and *Odontoglossum Humeanum*, Reichb. f. (t. 8873), a native of Southern Mexico.

The volume is dedicated to the Rev. William Wilks, M.A., V.M.H., "To whose labour and care as Secretary for over three decades of the Royal Horticultural Society gardencraft everywhere is greatly beholden."

The publishers of the Botanical Magazine, who with great public spirit have continued to issue the work throughout the war, have at last felt it incumbent upon them to give very careful consideration to its position. With much reluctance they have come to realise that the continuance of the work is dependent on its paying its footing all round. This it is not able to do. They have therefore resolved to terminate the Fourth Series of the Botanical Magazine with the present volume, and before committing themselves further, to ascertain in some way whether the Magazine is really worth continuing, and if so under what conditions it might be possible to do so.

Flowering Plants of South Africa.—The publication of the first number of "The Flowering Plants of South Africa" marks yet another phase of the work which comes under the scope of the Botanical Survey of the Union, the Director of which movement, Dr. I. B. Pole-Evans, has edited the work in question. The magazine, which contains hand-coloured figures with descriptions of the Flowering Plants indigenous to South Africa, and which is modelled on Curtis's *Botanical Magazine*, has as its object the fostering of interest of South Africans in the form and cultivation of their native plants. It is trusted that the work will appeal to a large public and that its circulation will be long-lived. It might be suggested, especially in view of the misleading effect which occurs on plates 3 and 4, that the omission of names on the plates themselves would be an improvement to the magazine.

The Bahama Flora.—A copy of their recently published volume entitled The Bahama Flora has been presented to Kew by Doctors N. L. Britton and C. H. Millspaugh. The work extends to nearly 700 pages, and includes not only the flowering plants and ferns but also the whole of the cellular Cryptogams, with a

total of 1952 species, of which 185, or rather under a tenth, are estimated as endemic. The flowering plants are naturally the best known, and of these 133 out of 995 are not yet known from elsewhere. Not one of 33 known ferns is peculiar to the islands, and only one out of 69 Bryophyta. In each case the distribution outside the Bahamas is briefly indicated. Cultivated species have been excluded except such as appear to have become spontaneous. The Bahamas form an archipelago of 29 islands and an enormous number of cays and isolated rocks, with a total land area of 4424 square miles, the total length being about 600 miles. The surface is mostly low, hilly and rocky, the hill ranges usually running lengthwise of the islands, and the highest hardly exceeding 200 ft. Mangrove swamps are local along the coastal lines, and there are no fresh water streams, but fresh water marshes exist on some of the larger islands. There are extensive forests of the Caribbean Pine (*Pinus caribaea*), on a few of the larger islands, also some hardwood forests (coppices), like the "hammocks" of southern Florida, and these are made up of a considerable variety of tall tree species, with a number of shrubs and low trees on the "Scrub-lands." The relationships of the native flora are with those of Florida, Cuba and Hispaniola, and it is assumed that the species which are in common have been transported from one or another of the land masses by natural agencies of winds, migratory birds or oceanic currents. The work contains a brief introduction, an account of the Explorations and Collections of the Bahamas—beginning with Thomas Walker, Chief Justice for the Bahama Plantation, who sent plants from New Providence to Mr. James Petiver, in London early in the eighteenth century—a Bibliography of works and papers relating to the Flora of the Bahamas, and a comprehensive Index. A great amount of attention has been paid to the Bahamas during recent years, and the work forms an important contribution to the history of the islands.

R. A. R.

The Hardwoods of Australia and their Economics.*—The terms "hardwoods" and "softwoods" as applied to timbers in general are out of date and misleading, for they are not given by reason of the species included in each group possessing certain degrees of hardness, but are used to distinguish dicotyledonous and coniferous trees, and it would be advantageous if these terms could be so changed that the woods now known as "softwoods" should in future be called "conifers" and those known as "hardwoods" altered to "dicotyledons." The absurdity of the terms as at present applied is very pronounced, for some of the softest known woods such as *Ochroma*, *Erythrina*, and *Eriodendron*, are included amongst hardwoods, whilst *Callitris*, *Tetra-*

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* The Hardwoods of Australia and their Economics, pp. xvi, 522, with 137 coloured and 194 black-and-white plates. By Richard T. Baker, F.L.S., Curator and Economic Botanist, Technological Museum, Sydney. Published by authority of the Government of the State of New South Wales. Obtainable from the Government Printer, Sydney, and from Messrs. Kegan Paul, Trench, Trübner & Co., 68, Carter Lane, Ludgate Hill, London, E.C. 4. Boards 25s., paper 22s. 6d. net.

clinis, and other hard coniferous woods are graded with soft-woods. In the preparation of the work under review, Mr. Baker has been faced with this difficulty, and he has commenced breaking down the distinction by including *Callitris* amongst Australian hardwoods. The work is in every way excellent, and it forms a valuable aid to the identification of the more important Australian timbers. It is divided into three parts. Part i. deals with the physical properties of timbers, and a good deal of attention is devoted to the colour of newly-worked wood as a means of identification. Mr. Baker has made a special study of this character, and upwards of 250 species are graded under the colours dark red, red, pink, grey, chocolate, yellow, pale, and white, whilst there are numerous coloured photographs of the wood of the more important species. In this section he also gives an account of the anatomy of wood. An interesting table is that devoted to the comparative combustibility of timbers. Of 117 kinds enumerated the best fire resisters are *Eucalyptus Fletcheri* and *Syncarpia laurifolia*. Compared with British Oak the resistance is nearly eight and five times respectively. Part ii. is devoted to descriptions of woods, the genera being arranged in botanical sequence in their respective families. The notices of the important woods commence with a general description of the timber and its uses, followed by particulars of its hardness, grade and weight. Then come the results of strength tests, followed by the anatomical features, and concluded with a systematic description of the tree and its geographical range. These descriptions, with the necessary plates and micro-photographs, occupy some 354 pages ended with lists of the various trees in their different degrees of hardness under the headings extremely hard, very hard, hard, and moderate. The species of the difficult genus *Eucalyptus* have been grouped under the headings Bloodwoods, Mahoganies, Boxes, Tallowwoods, Stringybarks, Woollybutts, Gums, Peppermints, Ashes, and Ironbarks. The different groups are distinguishable by the bark, and coloured photographs are given of the bark of each group. The third part is devoted to technical articles upon such subjects as nomenclature, seasoning, wood preservation and uses. The uses of Australian timbers are demonstrated by numerous photographs of constructive work, furniture, panelling, carving, etc. Mr. Baker is anxious that something should be done to limit the use of common names for timber, and suggests that greater use should be made of scientific names, particularly specific names in large genera. He informs us that this is already an accomplished fact in the essential oil industry of Australia and that it works well. The whole work is concluded with a very good index. W. D.

The Nature-Study of Plants*.—This book is divided into two parts, of which the first forms a general introduction to the study of plant-life and the second deals in detail with the life-history of the Herb Robert (*Geranium Robertianum*).

* The Nature-Study of Plants. By T. A. Dymes, F.L.S. London: Society for Promoting Christian Knowledge, 1920; pp. 173; 53 illustrations; price 6s.

The underlying idea throughout the book is comparison of the phenomena of plant-life with those of human-life. While the text is certainly written in a way to stimulate the curiosity of the reader and induce him to find out things for himself, the standpoint taken is frankly teleological and vitalistic, and such phrases as "the Scheme of Creation" frequently recur. The work should be useful to teachers of Nature Study and suggestive to "Hobby-Botanists," for whom it is primarily written. It is a pity that some of the figures are not more worthy of the text. W. B. T.

Trees for the Falkland Islands.—Owing to representations made from time to time to the Colonial Office respecting the desirability of experimenting with the cultivation of forest and other trees in the Falkland Islands, and notably from the interest taken in the matter by Major F. R. St. Johnston, lately Colonial Secretary in the Islands, the advice of the Director of the Royal Botanic Gardens, Kew, was sought on the subject in 1919. Under his direction an account of the various efforts made in the past to establish forest trees in the Islands was compiled, and this, together with the recommendations made to the Colonial Office, was published in *K.B.*, 1919, pp. 209–217. In the experimental scheme presented, a recommendation was made that a man skilled in forestry matters, capable of carrying out experiments and instructing the islanders, should be sent out to control any attempt that might be made to establish plantations, and that a fairly wide selection of species should be tried.

During the spring and summer of 1920, further correspondence took place between Major St. Johnston, the newly appointed Governor of the Falkland Islands, Mr. J. Middleton, C.M.G., the Colonial Office, and the Royal Botanic Gardens. Further, advantage was taken of the presence of the Governor in London to discuss the matter in all its bearings. These deliberations resulted in the appointment of Mr. James Reid, a student Forester from the Royal Botanic Gardens, Edinburgh, who had previously had several years experience in forests in Scotland, to the post of Forest Officer in the Falkland Islands (*K.B.*, 1920, p. 286). He sailed on November 24th, and took out with him a consignment of young trees procured from Messrs. Dicksons, of Chester, with various seeds and cuttings from Kew.

As the experiment is likely to prove of more than ordinary interest permission has been obtained from the Colonial Office to publish the list of plants and cuttings sent out.

Plants supplied by Messrs. Dicksons:—

Alnus glutinosa, 1½–2 ft. ...	2,000	*Picea sitchensis*, 6–9 in. ...	2,000
„ *incana*, seedlings ...	1,000	„ *excelsa*, 6–9 in. ...	2,000
Fraxinus excelsior, 2-year seedlings	1,000	*Acer Pseudoplatanus*, 1-year seedlings	2,000
Pyrus Aucuparia, 1–2 ft. ...	500	*Betula alba*, 2-year seedlings	2,000
Pinus Laricio, 6–12 in. ...	1,000	*Ulmus campestris*, 1½–2 ft.	1,000
— var. *nigricans*, 6–12 in.	500	„ *montana*, 1½–2 ft. ...	1,000
Pinus sylvestris, 6–9 in. ...	2,000	*Populus serotina*, 1½–2 ft. ...	1,000

Seeds of Scots Pine, Corsican Pine, Sitka Spruce, and Common Spruce to be sent at a later date.

Cuttings from Kew:—

Populus trichocarpa.
„ *Eugenii.*
„ *serotina.*
„ *marylandica.*
„ *canescens.*
„ *generosa.*
„ *nigra.*
Salix fragilis.
Salix alba.
„ *daphnoides.*
„ *purpurea.*
„ *rubra.*
„ *triandra.*
„ *caerulea.*
„ *Smithiana.*

Seeds from Kew:—

Acer Pseudoplatanus.
Alnus glutinosa.
„ *incana.*
„ *firma.*
Betula alba.
„ *papyrifera.*
Carpinus Betulus.
Cotoneaster bacillaris.
Fraxinus excelsior.
Laburnum alpinum.
„ *vulgare.*
Quercus Cerris.
„ *pedunculata.*

The following seeds were sent from Kew in May, 1919, in response to the request of Major St. Johnston, when he was Colonial Secretary:—

Alnus cordifolia.
„ *firma.*
„ *incana.*
Berberis Aquifolium.
„ *Darwinii.*
Betula lutea.
„ *Maximowiczii.*
„ *occidentalis.*
„ *papyrifera.*
Caragana arborescens.
Cornus alba.
„ *Mas.*
„ *officinalis.*
„ *sanguinea.*
Cupressus Lawsoniana.
Cytisus scoparius.
— var. *Andreanus.*
Fraxinus oregona.
„ *pennsylvanica?*
Genista virgata.
Pyrus Aucuparia.
— var. *moravica.*
Pyrus pinnatifida.
„ *prunifolia.*
„ *rotundifolia.*
Rosa sericea.
„ *Soulieana.*
Spartium junceum.
Thuya plicata.

On learning from the *Kew Bulletin* article that an organised attempt was to be made to establish plantations of trees in the Islands, Mr. B. C. Aston, Secretary of the New Zealand Institute, suggested that the present might be a favourable opportunity to undertake an experiment with New Zealand Flax (*Phormium tenax*), in the Falklands. In response to a request from Kew, Mr. J. A. A. Wallace, of Lochryan, Stranraer, very kindly sent twelve seedling plants four years old, and twelve seedling plants two years old, and a packet of seed, which have been sent out with the trees and cuttings in charge of the Forest Officer.

Care was taken that all the plants and cuttings were free from insect pests.

W. D.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1920.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1919. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

HERBACEOUS PLANTS.

Abronia arenaria.
umbellata.

Acaena glaucophylla.
laevigata.
macrostemon.
myriophylla.
Novae-Zelandiae.

Acanthus longifolius.

Achillea Ageratum.
argentea.
Clavennae.
decolorans.
Kellereri.
macrophylla.
nana.
serbica.
Wilczekii.

Aciphylla Colensoi.

Aconitum barbatum.
chinense.
columbianum.
gymnandrum.
Kusnezoffi.
lasianthum.
leptanthum.
moldavicum.
uncinatum.
Vulparia.
Wilsonii.

Actaea alba.
arguta.

Adenophora ornata.

Adenostyles viridis.

(693.) Wt. 158—829. 1,125. 12/19. J. T. & S., Ltd. G. 14.

Adlumia cirrhosa.

Aethionema amoenum.
cappadocicum.
pulchellum.

Agrostis alba.
nebulosa.

Allium atropurpureum.
giganteum.
grande.
Heldreichii.
kansuense.
karataviense.
macranthum.
neapolitanum.
odorum.
Ostrowskianum.
polyphyllum.
roseum.
Schuberti.
scorzonerifolium.
siculum.
sikkimense.
Tubergenii.
Victorialis.
zebdanense.

Alonsoa linifolia.
Warscewiczii.

Alstroemeria aurantiaca.
haemantha.
Ligtu.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
pallida.
rosea.

Alyssum argenteum.
creticum.
podolicum.
saxatile.
serpyllifolium.
sinuatum.
spinosum.
Wulfenianum.

Amarantus caudatus.
chlorostachys.
hypochondriacus.
polygamus.
retroflexus.

Amellus annuus.

Amethystea caerulea.

Amphicarpaea monoica.

Amsonia angustifolia.

Anacyclus officinarum.

Anaphalis cinnamomea.
nubigena.
Royleana.
triplinervis.

Androsace albana.
coccinea.
lactiflora.
lanuginosa.
primuloides.
villosa.

Andryala Agardhii.

Anemone albana.
alpina.
decapetala.
Halleri.
multifida.
pratensis.
Pulsatilla.
rivularis.
sulphurea.
sylvestris.
vitifolia.

Anemonopsis macrophylla.

Anthemis montana.
tinctoria.

Anthericum Liliago.
ramosum.

Antirrhinum hispanicum.
Orontium.

Aplopappus croceus.

Aquilegia Bernardii.
canadensis.
chrysantha.
coerulea.
flabellata.
glandulosa.
pyrenaica.
truncata.

Arabis arenosa.
bellidifolia.
verna.

Arctotis stoechadifolia.

Arenaria Bertolonii.
cephalotes.
foliosa.
gypsophiloides.
grandiflora.
montana.
pinifolia.
purpurascens.
sajanensis.

Argemone alba.
hispida.
mexicana.
ochroleuca.

Arisarum proboscideum.

Armeria canescens.
fasciculata.
majellensis.
plantaginea.
setacea.

Arnica latifolia.
longifolia.
montana.
sachalinensis.

Asclepias tuberosa.

Asperula azurea.
galioides.

Asphodeline liburnica.
lutea.

Asphodelus albus.

Aster alpinus.
Farreri.
atroviridis.
Glehnii.
himalaicus.
lichiangensis.
linariifolius.
Lipskyi.
pyrenaeus.
sericeus.
subcoeruleus.
vestitus.
yunnanensis.

Astilbe chinensis.
koreana.
rivularis.
simplicifolia.
Thunbergii.

Astragalus arcticus.
chinensis.
frigidus.
monspessulanus.
pentaglottis.
stipulatus.

Astrantia carniolica.
helleborifolia.

Athamanta Matthioli.

Atropa Belladonna.

Baeria coronaria.

Baptisia australis.

Barbarea arcuata.

Beckmannia erucaeformis.

Bellium bellidioides.

Berkheya purpurea.
radula.

Beta trigyna.

Biscutella ciliata.
didyma.

Bocconia cordata.

Bongardia Rauwolfii.

Brachycome iberidifolia.

Brachypodium caespitosum.
japonicum.
pinnatum.

Brassica campestris.
Erucastrum.
juncea.
napus var. dichotoma.
rugosa.

Brickellia grandiflora.

Briza maxima.
minor.

Bromus ciliatus.
erectus.
japonicus.
Kalmii.
maximus.
rubens.
secalinus.
squarrosus.
unioloides.

Bulbinella Hookeri.

Buphthalmum salicifolium.

Bupleurum falcatum.
longifolium.
rotundifolium.
sachalinense.
stellatum.

Caccinia strigosa.

Calamagrostis Epigeios.

Calamintha alpina.

Calandrinia grandiflora.
speciosa.

Calceolaria polyrrhiza.

Callirhoë pedata.

Callistephus hortensis.

Camassia Fraseri.
Leichtlinii.
montana.

Camelina foetida.
sativa.

Campanula arvatica.
barbata.
bononiensis.
colorata.
Grosseckii.
kewensis.
Kolenatiana.
lactiflora.
lanata.
latifolia.
latiloba.
longistyla.
Loreyi.
macrostyla.
phyctidocalyx.
primulaefolia.
pulla.
punctata.
Raddeana.
rhomboidalis.
serotina.
speciosa.
spicata.
thyrsoides × spicata.

Capsella grandiflora.

Carbenia benedicta.

Carduus cernuus.
tenuiflorus.

Carex binervis.
laevigata.
pendula.

Carum copticum.

Catananche coerulea.

Cathcartia villosa.

Celmisia coriacea.
grandiflora.
holosericea.
spectabilis argentea.
verbascifolia.

Centaurea atriplicifolia.
axillaris.
dealbata.
macrocephala.
montana.
moschata.
pulchra.
rupestris.

Centranthus macrosiphon.

Cephalaria radiata.
tatarica.

Cerastium Biebersteinii.
macranthum.
tomentosum.

Chaerophyllum aromaticum.
nodosum.
roseum.

Charieis heterophylla.

Chenopodium ambrosioides.
Bonus-Henricus.
capitatum.
urbicum.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum anserinaefolium.
Aucherianum.
carinatum.
caucasicum.
cinerariaefolium.
coronarium.
corymbosum.
pallens.

Chrysopon Gryllus.

Cimicifuga cordifolia.
foetida.
racemosa.

Clarkia elegans.
pulchella.

Clematis Stanleyi.

Cnicus Diacantha.
eriophorus.
ochroleucus.
syriacus.

Codonopsis ovata.

Collinsia bicolor.
grandiflora.

Collomia coccinea.
grandiflora.

Convolvulus undulatus.

Coreopsis auriculata.
verticillata.

Coriandrum sativum.

Coronilla montana.

Cortusa Matthioli.

Corydalis capnoides.
lutea.

Cosmidium Burridgeanum.

Cousinia hystrix.

Craspedia alpina.

Cremanthodium reniforme.

Crepis grandiflora.
rubra.

Crocus asturicus.
chrysanthus.
medius.

Crucianella aegyptiaca.

Cuminum Cyminum.

Cuphea Zimapanii.

Cynoglossum nervosum.

Cypripedium spectabile.

Dactylis altaica.

Dahlia variabilis.

Datura inermis.

Delphinium Brunonianum.
caucasicum.
decorum.
Delavayi.
Geyeri.
grandiflorum.
Menziesii.
occidentale.
pictum.
speciosum.

Deschampsia caespitosa.
flexuosa.
tenella.

Deyeuxia Langsdorfii.

Dianthus alpinus.
arenarius.
Armeria.
caesius.
Carthusianorum.
Caryophyllus.
deltoides.
fragrans.
frigidus.
furcatus.
gallicus.
giganteus.
inodorus.
leptopetalus.
Lereschii.
neglectus.
pallidiflorus.
petraeus.
Requienii.
Seguieri.
spiculifolius.
subacaulis.

Dianthus—*cont.*
superbus.
Waldsteinii.

Diascia Barberae.

Dicentra thalictrifolia.

Dicranostigma leptopodum.

Dictamnus albus.

Digitalis ambigua.
lanata.

Dimorphotheca hybrida.
pluvialis.

Dodecatheon Lemoinei.
Meadia.

Dolichos ornatus.

Draba aizoides.
Bertolonii.
fladnizensis.
frigida.
hirta.
incana.
nivalis.
rigida.
rupestris.
Salomonii.
surculosa.

Dracocephalum Moldavica.
parviflorum.

Dryas Drummondii.
lanata.

Eccremocarpus scaber.

Echinops bannaticus.
echinacea.
Tournefortii.

Emilia flammea.

Epilobium crassum.
Dodonaei.
luteum.
rosmarinifolium.

Epipactis palustris.

Eragrostis abyssinica.
interrupta.

Eremostachys laciniata.

Eremurus himalaicus.
robustus.
— var. Elwesianus.

Erigeron bellidifolius.
aurantiacus.
Coulteri.
glabellus.
glaucus.
grandiflorus.
multiradiatus.
neo-mexicanus.
salsuginosus.
uniflorus.

Erinus alpinus.

Eriogonum racemosum.
subalpinum.

Erodium amanum.
Botrys.
hymenodes.
macradenum.
Manescavii.
petraeum.

Eryngium alpinum.
giganteum.

Erysimum rupestre.

Eschscholzia californica.
Douglasii.

Eucharidium concinnum.

Farsetia eriocarpa.

Fedia Cornucopiae.

Ferula glauca.

Festuca heterophylla.
Myuros.
rigida.

Fragaria indica.

Francoa appendiculata.
ramosa.

Fritillaria Stracheyi.

Galax aphylla.

Galega orientalis.
patula.

Galium thymifolium.

Gaultheria trichophylla.

Gaudinia fragilis.

Gentiana asclepiadea.
crassicaulis.
Cruciata.
dahurica.
decumbens.
Freyniana.
Grombezewskii.
Kesselringii.
lutea.
macrophylla.
phlogifolia.
septemfida.
sikkimensis.
straminea.
stylophora.
tibetica.

Geranium albiflorum.
Donianum.
eriostemon.
Fremontii.
grandiflorum.
ibericum.
incisum.
nodosum.
rivulare.
sessiliflorum.

Gerbera Anandria.

Geum album.
bulgaricum.
chiloense.
Heldreichii.
montanum.

Geum—*cont.*
parviflorum.
rhaeticum.
triflorum.

Gilia achilleaefolia.
androsacea.
capitata.
dianthoides.
micrantha.
multicaulis.
squarrosa.
tricolor.

Gillenia trifoliata.

Glaucium corniculatum.
flavum var. tricolor.
leiocarpum.

Globularia cordifolia.
vulgaris.

Glyceria distans.
plicata.

Gomphrena globosa.

Gypsophila elegans.
Steveni.

Haberlea Ferdinandi-Coburgii.

Halenia elliptica.

Hastingsia alba.

Hebenstreitia comosa.

Hedysarum esculentum.
flavescens.
Semenovii.
sericeum.

Helianthemum canum.

Helichrysum bracteatum.
Stoechas.

Heliotropium europeum.

Helipterum Manglesii.

Hemerocallis citrina.

Herbertia pulchella.

Hesperis matronalis.

Heterospermum Xanti.

Heuchera Drummondii.
micrantha.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
Bornmülleri.
cappadocicum.
gymnocephalum.
Jankae.
lanatum.
villosum.

Hilaria rigida.

Horminum pyrenaicum.

Hunnemannia fumariaefolia.

Hyacinthus azureus.
romanus.

Hymenophysa pubescens.

Hyoscyamus albus.
muticus.

Hypecoum procumbens.

Hypericum Coris.
delphicum.
linarifolium.
nummularium.
olympicum.

Hypochaeris glabra.

Iberis Amara.
Lagascana.
Tenoreana.

Incarvillea Delavayi.
grandiflora.

Inula ensifolia.
hirta.
Hookeri.
macrocephala.
orientalis.
racemosa.
Royleana.

Iris aurea.
Bulleyana.
Clarkei.
chrysographis.
foetidissima.
Kaempferi.
laevigata.
longipetala.
setosa.
tenax.
versicolor.

Isatis glauca.

Jasione perennis.

Juncus alpinus.
Chamissonis.
chrysocarpus.

Jurinia cyanoides.

Kitaibelia vitifolia.

Kochia trichophila.

Koeleria albescens.
phleoides.

Lactuca macrophylla.
perennis.

Lagurus ovatus.

Lallemantia canescens.
peltata.

Lamarckia aurea.

Lathyrus angulatus.
annuus.
Aphaca.
cirrhosus.
Clymenum.
cyaneus.

Lathyrus—*cont.*
Jordani.
laxiflorus.
luteus.
maritimus.
Nissolia.
Ochrus.
pisiformis.
polyanthus.
pubescens.
rotundifolius.
setifolius.
tingitanus.
undulatus.
variegatus.

Lavatera cachemiriana.
trimestris.

Layia elegans.

Leontopodium alpinum.

Lepachys columnaris.

Leptarrhena amplexifolia.

Leptosyne Douglasii.
maritima.

Leucojum aestivum.
vernum.

Liatris spicata.

Ligusticum pyrenaicum.
scoticum.

Lilium giganteum.
pyrenaicum.

Limnanthes alba.
Douglasii.

Linaria dalmatica.
multipunctata.
saxatilis.
triphylla.
tristis.
viscida.

Lindheimera texana.

Linum nervosum.
usitatissimum.

Lobelia ramosa.

Lotus Tetragonolobus.

Lupinus luteus.
micranthus.
mutabilis.
nanus.
nootkatensis.
perennis.
pilosus.
pubescens.

Luzula Hostii.
nivea.

Lychnis alpina.
chalcedonica.
Lagascae.
nigrescens.
Preslii.
Sartorii.

Lycurus phleoides.

Lythrum alatum.

Madia elegans.
sativa.

Malcomia maritima.

Malva Alcea.
parviflora.

Malvastrum campanulatum.
limense.

Mandragora officinarum.

Meconopsis aculeata.
cambrica.
latifolia.
— var. alba.
paniculata.
Prattii.
Wallichii.

Medicago falcata.
Murex.
orbicularis.
turbinata.

Melica altissima.
ciliata.

Mentzelia Lindleyi.

Meum athamanticum.

Mirabilis divaricata.
Jalapa.

Moltkia petraea.

Monolepis trifida.

Morina betonicoides.
longfolia.

Muscari armeniacum.
comosum.
compactum.
neglectum.
paradoxum.

Myosurus minimus.

Narcissus Bulbocodium.

Nardus stricta.

Neja gracilis.

Nicandra physaloides.

Nicotiana rustica.
Sanderae.
Tabacum.

Nigella corniculata.
damascena.
hispanica.

Oenothera acaulis.
amoena.
densiflora.
odorata.
pumila.
speciosa.
tenella.

Omphalodes linifolia.

Ononis alopecuroides.

Onosma albo-roseum.

Orchis foliosa.

Origanum Majorana.

Ornithogalum arcuatum.
narbonense.

Oxytropis baicalensis.
ochroleuca.
pilosa.

Paeonia anomala.
Emodi.
hirsuta.
lutea.
paradoxa.
Veitchii.
Woodwardii.

Panicum capillare.

Papaver alpinum.
commutatum.
glaucum.
laevigatum.
lateritium.
nudicaule.
orientale.
pavoninum.
rupifragum.
somniferum.

Paradisia Liliastrum.

Parnassia palustris.

Patrinia palmata.

Pennistum latifolium.

Pentstemon acuminatus.
alpinus.
arizonicus.
barbatus.
confertus.
deustus.
diffusus.

Pentstemon—*cont.*
glaber.
glaucus.
heterophyllus.
laevigatus.
Menziesii var. Scouleri.
ovatus.
secundiflorus.

Petunia nyctaginiflora.

Peucedanum graveolens.

Phleum arenarium.
asperum.
Michelii.

Phlomis pratensis.
tuberosa.
umbrosa.
viscosa.

Physalis Alkekengi.
Bunyardii.
Franchetii.

Physochlaina orientalis.

Physospermum cornubiense.

Physostegia virginiana.

Phyteuma Michelii.
orbiculare.
Scheuchzeri.
spicatum.

Pimpinella Anisum.

Plantago Candollei.
Coronopus.
Myosurus.
Psyllium.
serpentina.

Platycodon grandiflorum.
— var. Mariesii.

Pleurospermum Golaka.

Podolepis acuminata.

Podophyllum Emodi.

Polemonium flavum.
grandiflorum.
mexicanum.
pauciflorum.

Polygonum alpinum.
vacciniifolium.
viviparum.

Polypogon littoralis.
monspeliensis.

Polypteris Hookeriana.

Portulaca grandiflora.

Potentilla argyrophylla.
calycina.
crinita.
glandulosa.
gracilis.
Herbichii.
Meyeri.
montenegrina.
Mooniana.
multifida.
nepalensis.
nevadensis.
pedunculata.
pennsylvanica.
recta.
rivalis.
rupestris.
sericea.
tanacetifolia.

Poterium alpinum.
muricatum.

Preslia cervina.

Primula Beesiana.
Bulleyana.
conspersa.
darialica.
farinosa.
floribunda.
involucrata.
pseudo-sikkimensis
pulverulenta.
reticulata.
rosea.
saxatilis.
sikkimensis.

Psoralea acaulis.
macrostachya.
physodes.

Pycnanthemum lanceolatum.

Ramondia pyrenaica.

Ranunculus aconitifolius.
chaerophyllus.
falcatus.
millefoliatus.
nissanus.
platanifolius.

Reseda virgata.

Rheum acuminatum.
Alexandrae.
nobile.

Ricotia Lunaria.

Rodgersia aesculifolia.
pinnata.
sambucifolia.
tabularis.

Roemeria hybrida.

Rudbeckia ampla.
amplexicaulis.

Rumex hymenosepalus.
maximus.

Salvia argentea.
Bertolonii.
glutinosa.
nutans.
Sclarea.
uliginosa.
virgata.

Sambucus Ebulus.

Santolina pinnata.

Saponaria Vaccaria.
Wiemannii.

Saussurea albescens.
hypoleuca.
pectinata.

Saxifraga caesia.
canaliculata.
catalaunica.
cartilaginea.
cernua × granulata.
cochlearis.
— var. minor.
crustata.
decipiens.
Delavayi.
diversifolia.
exarata.
granulata.
Hausmannii.
lingulata.
— var. lantoscana.
longifolia.
luteo-viridis.
manshuriensis.
Mertensiana.
montavoniensis.
mutata.
nivalis.
pedemontana.
petraea.
rotundifolia.
tyrolensis.

Scabiosa candicans.
caucasica var. connata.
Columbaria.
gramuntia.
prolifera.
vestina.

Scilla autumnalis.
Lilio-hyacinthus.

Scopolia sinensis.

Scorzonera hispanica.
purpurea.

Sedum altissimum.
elongatum.
Ewersii.
kamtschaticum.
Sedum—*cont.*
pilosum.
rhodanthum.
Semenovii.
spathulifolium.

Selinum serbicum.
tenuifolium.
vaginatum.

Senecio abrotanifolius.
adonidifolius.
clivorum.
diversifolius.
Doronicum.
elegans.
Ledebouri.
Ligularia.
Lyallii.
Mortonii.
Przewalskii.
squalidus.
stenocephalus.

Serratula atriplicifolia.
heterophylla.
tinctoria.

Seseli elatum.
osseum.

Setaria glauca.
italica.

Sidalcea candida.
Listeri.
malvaeflora.
neo-mexicana.
spicata.

Siderites scordiodes.

Silene alpestris.
Armeria.
Asterias.
conoidea.
fimbriata.
italica.
linicola.
longicilia.
melandrioides.
noctiflora.
nocturna.

Silene—*cont.*
paradoxa.
pendula.
quadrifida.
Reichenbachii.
Schafta.
tenuis.
vallesia.
verecunda.
Zawadskii.

Silybum eburneum.
Marianum.

Sium sisarum.

Smyrnium Olusatrum.
perfoliatum.

Specularia pentagonia.
perfoliata.
Speculum.

Stachys graeca.
grandiflora.

Statice Bonduellii.
sinuata.

Swertia dilatata.
Hookeri.
Kingii.
longifolia.
multicaulis.
perennis.

Symphyandra pendula.
Wanneri.

Tanacetum argenteum.

Tellima grandiflora.

Thalictrum aquilegifolium.
corynellum.
flavum.
glaucum.
minus.
squarrosum.

Thermopsis fabacea.
lanceolata.

Thymus odoratissimus.

Trautvetteria palmata.

Tricyrtis macropoda.

Trifolium ochroleucum.
pannonicum.

Trigonella coerulea.
corniculata.
Foenum-graecum.
polycerata.

Trillium grandiflorum.

Trollius sinensis.
yunnanensis.

Tulipa australis.
dasystemon.
Kaufmanniana.
linifolia.
Sprengeri.

Ursinia pulchra.

Urtica pilulifera.

Valerianella carinata.
dentata.
echinata.
eriocarpa.
vesicaria.

Verbascum Blattaria.
Chaixii.
olympicum.
phoeniceum.

Verbena bonariensis.

Verbesina helianthoides.

Veronica austriaca.
Bidwillii.
fruticulosa.
gentianoides.
incana.
saxatilis.
spicata.

Vesicaria grandiflora.
utriculata.

Vicia angustifolia.
calcarata.
melanops.
pyrenaica.
unijuga.

Vincetoxicum fuscatum.

Viola altaica.
cornuta.
persicifolia.

Xanthocephalum gymnospermoides.

Zygadenus elegans.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax divaricatum.
sessiliflorum.
setchuenense.

Acer circinatum.
dasycarpum.
glabrum.
Heldreichii.
hyrcanum.
insigne.
Lobelii.
macrophyllum.
micranthum.
Miyabei.
monspessulanum.
neglectum.
nikoense.
opulifolium.
pennsylvanicum.
tataricum.
tetramerum.
Trautvetteri.
Tschonoskii.

Actinidia arguta.

Aegle sepiaria.

Aesculus indica.

Alnus barbata.
cordifolia.
elliptica.
firma.
glutinosa.
incana.
japonica.
mollis.
nitida.
oregona.
orientalis.
serrulata.
sitchensis.
tenuifolia.
viridis.

Amelanchier canadensis.
vulgaris.

Aralia chinensis.

Asimina triloba.

Berberis aggregata.
angulosa.
aristata.
Beaniana.
brachypoda.
canadensis.
Chitria.
concinna.
consimilis.
Darwinii.
diaphana.
dictyophylla.
dubia.
Edgeworthiana.
Francisci-Ferdinandii.
Gagnepainii.
Guimpelii.
Hookeri.
Lycium.
orthobotrys.
polyantha.
Prattii.
Sargentiana
Sieboldii.
sinensis.
Soulieana.
Stapfiana.
subcaulialata.
thibetica.
Thunbergii.
Tischleri.
umbellata.
Veitchii.
virescens.
Wilsonae.
yunnanensis.

Betula alaskana.
coerulea.
corylifolia.

Betula—*cont.*
Ermanii.
— var. nipponica.
fruticosa.
humilis.
japonica var. szechuanica.
kenaica.
lenta.
lutea.
Maximowiczii.
Medwediewii.
occidentalis.
papyrifera.
populifolia.
pumila.
utilis.
— var. Jacquemontii.

Bruckenthalia spiculifolia.

Buddleia albiflora.
japonica.
nivea.
variabilis.
— var. Veitchiana.

Bupleurum fruticosum.

Buxus sempervirens.

Callicarpa Giraldiana.
japonica.

Calycanthus floridus.
glaucus.
Mohrii.
occidentalis.

Camellia cuspidata.

Caragana ambigua.
arborescens.
aurantiaca.
Boisii.
decorticans.
frutescens.
microphylla.

Carmichaelia australis.
flagelliformis.

Carpinus caroliniana.
orientalis.
polyneura.

Cassinia fulvida.

Ceanothus americanus.
integerrimus.
papillosus.
thyrsiflorus.
velutinus.

Cedrus atlantica.
Deodora.
Libani.

Celastrus articulatus.
flagellaris.
scandens.

Celtis glabrata.
occidentalis.
Vilmoriniana.

Cephalotaxus drupacea.
Fortunei.
pedunculata.

Cercis Siliquastrum.

Chimonanthus fragrans.

Chionanthus retusus.
virginica.

Cistus albidus.
crispus.
hirsutus.
laurifolius.
platysepalus.
salvifolius.
tauricus.

Cladothamnus pyrolaeflorus.

Cladrastis amurensis.

Clematis aethusifolia var.
latisecta.
akebioides.
alpina.
connata.

Clematis—*cont.*
— var. velutina.
Fargesii.
fusca.
Gauriana.
grata.
heracleaefolia.
integrifolia.
intermedia.
ligusticifolia.
mandshurica.
montana.
— var. rubens.
orientalis.
Pitcheri.
pseudo-flammula.
Rehderiana.
Scottii.
Spooneri.
tangutica.
Veitchiana.
virginiana.

Clerodendron Fargesii.
trichotomum.

Clethra acuminata.
alnifolia.
— var. paniculata.
*canescens.
monostachya.

Colutea bullata.
longialata.
media.
orientalis.

Cornus alba.
Amomum.
Bretschneideri.
candidissima.
controversa.
glabrata.
macrophylla.
Nuttallii.
officinalis.
pubescens.
sanguinea.
stolonifera.

Cotoneaster acutifolia.
— var. villosula.
affinis.
amoena.
apiculata.
applanata.
bacillaris.
— var. obtusata.
bullata.
buxifolia.
divaricata.
Fontanesii.
foveolata.
Franchetii.
frigida.
Harroviana.
hebephylla.
Henryana.
horizontalis.
humifusa.
hupehensis.
laxiflora.
Lindleyi.
lucida.
microphylla.
moupinensis.
multiflora.
nitens.
Nummularia.
obscura.
pannosa.
pekinensis.
prostrata.
rotundifolia.
salicifolia var. floccosa.
— var. rugosa.
Simonsii.
thymifolia.
tomentosa.
uniflora.
Zabelii.

Crataegus acclivis.
altaica.
ambigua.
Azarolus.
basilica.
Beckwithae.
Boyntonii.
Buckleyi.
canadensis.
Carrierei.
coccinea.
cordata.

Crataegus—*cont.*
cuneata.
dilatata.
Downingii.
durobrivensis.
Ellwangeriana.
elongata.
foetida.
Forbesae.
georgiana.
glandulosa.
grigoniensis.
Henryi.
infera.
intricata.
Jonesae.
Lambertiana.
leptophylla.
Macaulevi.
macracantha.
melanocarpa.
mollis.
oppositifolia.
orientalis.
pallens.
Peckii.
praecox.
Pringlei.
prunifolia.
pubescens var. stipulacea.
punctata.
semi-orbiculata.
sera.
sinaica.
succulenta.
tanacetifolia.
torva.
verecunda.
viridis.
Wheeleri.

Cupressus glabra.
Goveniana.
Lawsoniana.
macrocarpa.
nootkatensis.
pisifera.
thyoides.
torulosa.

Cydonia Maulei.

Cytisus albus.
biflorus.
capitatus.
glabrescens.
Heuffeli.
horniflorus.
nigricans.
— var. Carlieri.
purgans.
purpureus.
scoparius.
— var. Andreanus.
sessilifolius.

Daboëcia polifolia.

Daphniphyllum macropodum.

Davidia laeta.

Decaisnea Fargesii.

Deutzia compacta.
corymbosa.
crenata.
globosa.
glomeruliflora.
gracilis.
longifolia.
— var. Veitchii.
macrocephala.
mollis.
planifolia.
reflexa.
Sieboldiana.
Vilmoriniae.
Wilsonii.

Diervilla Lonicera.
rivularis.
sessilifolia.

Dipelta floribunda.
ventricosa.

Dipteronia sinensis.

Distylium racemosum.

Elaeagnus argentea.
multiflora.
umbellata.

Eleutherococcus Henryi.
leucorrhizus.
— var. fulvescens.
scaberulus.
Simonii.

Enkianthus campanulatus.

Erica australis.
cinerea.
lusitanica.
Mackaii.
scoparia.
stricta.
Tetralix.

Euonymus Hamiltonianus.
latifolius.
oxyphyllus.
planipes.
ussuriensis.
verrucosus.
yedoensis.

Evodia hupehensis.

Exochorda Albertii.
Giraldii.
grandiflora var. Wilsonii.

Fontanesia phillyraeoides.

Fothergilla Gardenii.
major.

Fraxinus coriacea.
Mariesii.
oregona.
Ornus.
parvifolia.
pennsylvanica.

Garrya elliptica.

Gaultheria cuneata.
procumbens.
Shallon.

Gaylussacia dumosa.

Genista aethnensis.
cinerea.
germanica.
pilosa.
radiata.
tinctoria.
— var. elatior.
virgata.

Halesia hispida.
tetraptera.

Hamamelis arborea.
— var. Zuccariniana.
japonica.
mollis.
vernalis.

Helianthemum alyssoides.
polifolium.
Tuberaria.
villosum.
vulgare.

Hydrangea aspera.
Bretschneideri.
canescens.
paniculata.
petiolaris.
radiata.
vestita.
xanthoneura.
— var. glabrescens.
— var. Wilsonii.

Hypericum Androsaemum.
aureum.
Buckleii.
elatum.
galioides.
hircinum.
Hookerianum.
inodorum.
Kalmianum.
patulum.
— var. Henryi.
perforatum.
prolificum.
uralum.

Ilex opaca.
Pernyi.
Sieboldii.
verticillata.

Indigofera Gerardiana.

Jasminum Beesianum.
fruticans.
humile.
nudiflorum.

Juglans nigra.

Kalmia cuneata.
glauca.
latifolia.

Laburnum alpinum.
vulgare.

Ledum latifolium.
palustre.

Leiophyllum buxifolium.

Leucothöe racemosa.

Leycesteria formosa.

Ligustrum Delavayanum.
Ibota.
insulare.
japonicum.
medium.
Prattii.
Quihoui.
yunnanense.

Lonicera alpigena.
chaetocarpa.
chrysantha.
coerulescens.
conjugalis.
deflexicalyx.
depressa.
dioica.
Ferdinandii.
floribunda.
gynochlamydea.
Henryi.
iberica.
Lonicera—*cont.*
involucrata.
Kesselringii.
Koehneana.
longa.
Maackii.
micrantha.
minutiflora.
Morrowii.
nigra.
obovata.
orientalis.
ovalis.
pileata.
prostrata.
Ruprechtiana.
segreziensis.
Sullivantii.
syringantha.
tatarica.
tragophylla.
translucens.
trichosantha.
Xylosteum.

Lupinus arboreus.

Lycium pallidum.

Lyonia ligustrina.

Magnolia acuminata.
glauca.
tripetala.

Menispermum canadense.

Menziesia globularis.

Microglossa albescens.

Myricaria germanica.

Neillia amurensis.
opulifolia.
stellata.
Torreyi.

Nesaea salicifolia.

Notospartium Carmichaeliae.

Nuttallia cerasiformis.

Nyssa sylvatica.

Olearia Haastii.
odorata.

Ononis fruticosa.
rotundifolia.

Paliurus australis.

Peraphyllum ramossimum.

Pernettya mucronata.

Pertya sinensis.

Petteria ramentacea.

Phellodendron amurense.
chinense.
sachalinense.

Philadelphus acuminatus.
brachybotrys.
californicus.
columbianus.
coronarius.
Falconeri.
Gordonianus.
incanus.
inodorus.
insignis.
latifolius.
Lewisii.
pekinensis.
pubescens.
sericanthus.
speciosissimus.
tomentosus.
Wilsonii.

Phillyraea angustifolia.

Photinia subumbellata.
variabilis.

Phyllodoce Breweri.
empetriformis.

Pieris formosa.
japonica.
mariana.

Pinus Armandii.
*halepensis.
koraiensis.

Piptanthus nepalensis.

Platanus acerifolia.
hispanica.
orientalis.

Potentilla fruticosa.
micrandra.

Prunus cornuta.
emarginata.
japonica.
pennsylvanica.

Pseudolarix Fortunei.

Ptelea isophylla.
trifoliata.

Pyracantha angustifolia.
coccinea.
crenulata.
— var. Rogersiana.
Gibbsii.

Pyrus alnifolia.
alpina.
americana.
— var. nana.
arbutifolia.
Aria var. majestica.
Aucuparia var. moravica.
auricularis.
Conradinae.
crataegifolia.
decurrens.
floribunda.
Folgneri.
Hostii.
hybrida.
kansuense.
Keissleri.
lobata.
Meinichii.
minima.

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Niedzwetzkyana.
nigra.
pekinensis.
pinnatifida.
pohuashanensis.
Prattii.
prunifolia.
Ringo.
rivularis.
rotundifolia.
salicifolia.
sambucifolia.
Sargentii.
scalaris.
setschwanensis.
sikkimensis.
sorbifolia.
Sorbus.
theifera.
Toringo.
Torminalis.
transitoria var. toringoides.
Tschonoskii.
Vilmorinii.
yunnanensis.
Zahlbruckneri.
Zumi.

Quercus bicolor.
conferta.
fulhamensis.
lanuginosa.
Libani.
Mirbeckii.
rubra.

Raphiolepis japonica.

Rhamnus Alaternus.
cathartica.
davurica.
fallax.
Frangula.
imeritina.
japonica.
mandshurica.
Purshiana.
spathulaefolia.
utilis.

Rhododendron ambiguum.
Augustinii.
brachycarpum.
californicum.
concinnum.
decorum.
discolor.
Fargesii.
fastigiatum.
ferrugineum.
Fortunei.
halense.
hirsutum.
japonicum.
lepidotum.
maximum.
Metternichii.
micranthum.
polylepis.
punctatum.
racemosum.
rhombicum.
rubiginosum.
*Schlippenbachii.
siderophyllum.
Smirnowii.
*Tschonoskii.
Vaseyi.
viscosum.
yanthinum.
yunnanense.

Rhodotypos kerrioides.

Ribes alpinum.
bracteosum.
cereum.
cruentum.
divaricatum.
holosericeum.
mandshuricum.
petraeum.
robustum.
rotundifolium.
stenocarpum.
Warscewiczii.

Robinia Kelseyi.
neo-mexicana.

Rosa alpina.
— var. pyrenaica.
coruscans.
Davidii.
— var. elongata.
elegantula.
glutinosa.
gymnocarpa.
Helenae.
Hugonis.
lucens.
Luciae.
macrophylla.
microphylla.
mollis.
Moyesii.
— var. Fargesii.
multibracteata.
— var. Wilsonii.
nitida.
nutkana.
omiensis.
— var. atrosanguinea.
— var. polyphylla.
— var. pteracantha.
pisocarpa.
rubrifolia.
rugosa.
Seraphinii.
sericea.
sertata.
setipoda.
sicula.
Soulieana.
spinulifolia.
Sweginzowii.
Webbiana.
Willmottiae.
Woodsii.

Rubus adenophorus.
biflorus var. quinquefloru
canadensis.
chroosepalus.
coreanus.
flosculosus.
Giraldianus.
illecebrosus.
inopertus.
lasiostylus.
— var. dizygos.
mesogaeus.

Rubus—*cont.*
nigro-baccus.
nutkanus.
occidentalis.
odoratus.
omiensis.
parvifolius.
phoenicolasius.
pubescens.
Swinhoei.
thibetanus.
Thunbergi var. glabellus.
trianthus.
Veitchii.
xanthocarpus.

Ruta graveolens.

Schizandra chinensis.

Schizophragma hydrangeoides.
integrifolia.

Sciadopitys verticillata.

Securinega fluggeoides.
ramiflora.

Skimmia japonica.

Sophora flavescens.
viciifolia.

Spartium junceum.

Spiraea Aitchisonii.
arborea.
— var. glabrata.
arcuata.
bella.
betulifolia.
bracteata.
canescens.
chamaedrifolia.
discolor.
— var. dumosa.
expansa.
Henryi.
japonica.
— var. ovalifolia.
laevigata.
Lindleyi.
longigemmis.

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Nobleana.
Rosthornii.
salicifolia.
sorbifolia.
— var. stellipila.
tomentosa.
Veitchii.
vestita.
Wilsonii.

Stachyurus chinensis.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Stephanandra Tanakae.

Stewartia pentagyna.
Pseudo-camellia.

Stranvaesia Davidiana.
var. undulata.
salicifolia.

Styrax americanum.
japonicum.
Obassia.
Wilsonii.

Symphoricarpus Heyeri.

Syringa albo-rosea.
Emodi.
japonica.
Josikaea.
Julianae.
pekinensis.
villosa.
Wilsonii.

Taxus cuspidata.

Thuya japonica.
orientalis.
plicata.

Trochodendron aralioides.

Umbellularia californica.

Vaccinium Arctostaphylos.
corymbosum.
hirsutum.
melanocarpum.
pallidum.
Vitis-idaea.

Viburnum americanum.
betulifolium.
brevipes.
burejaeticum.
Canbyi.
cotinifolium.
Davidii.
Henryi.
hupehense.
ichangense.
Lantana.
lobophyllum.
ovatifolium.
phlebotrichum.
pubescens.
rhytidophyllum.
Sargentii.
theiferum.
Veitchii.
venosum.
Wilsonii.

Wistaria chinensis.
floribunda.
multijuga.

Zanthoxylum alatum.
Bungei.
piperitum.

Zenobia speciosa.
— var. pulverulenta.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

APPENDIX II.—1920.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. Sir David Prain, I.M.S., C.M.G., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., Sc.D., F.R.S., F.L.S.
Assistant, First Class - -	- *John Aikman.
" " " - -	- *William Nicholls Winn.
Keeper of Herbarium and Library	Otto Stapf, Ph.D., F.R.S. F.L.S.
Assistant, First Class - -	- Charles Henry Wright, A.L.S.
" " " - -	- *Robert Allen Rolfe, A.L.S.
" " " - -	- *Sidney Alfred Skan.
" " " - -	- Thomas Archibald Sprague, B.Sc., F.L.S.
" Second Class -	- Elsie Maud Wakefield, F.L.S.
" " " -	- *William Bertram Turrill, M.Sc.
" " " -	- *John Hutchinson, F.L.S.
" for India -	- S. T. Dunn, B.A., F.L.S.
" for South Africa -	- Amy Gertrude Corbishley, B.A.
Assistant Keeper, Jodrell Laboratory.	Leonard Alfred Boodle, F.L.S.
Keeper of Museums - -	- John Masters Hillier.
Assistant, First Class - -	- *John H. Holland, F.L.S.
" Second Class -	- *William Dallimore.
Preparer - - - -	- Laurance John Harding.

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Royal Botanic Gardens, Kew—*continued.*

Curator of the Gardens	William Watson, A.L.S.
Assistant Curator	*William J. Bean.
Foremen :—	
Herbaceous Department	*Walter Irving.
Arboretum	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department	*William Taylor.
Temperate House	*Charles P. Raffill.
Storekeeper	*George Dear.

Imperial Bureau of Mycology, Kew :—

Director	E. J. Butler, M.B., F.L.S.

Aberdeen.—University Botanic Garden :—

Professor	W. G. Craib, F.R.S.E., F.L.S.

Cambridge.—University Botanical Department :—

Professor	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	——
Curator, University Museum.	H. H. Thomas, B.A.
Curator of Garden	*F. G. Preston.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper	Sir Frederick W. Moore, M.A., F.L.S.
Assistant	*J. W. Besant.

Trinity College Botanic Gardens :—

Professor	H. H. Dixon, Sc.D., F.R.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper	Sir Isaac B. Balfour, K.B.E., M.A., M.D., LL.D., Sc.D., F.R.S., F.L.S.
Assistant to Regius Keeper.	W. W. Smith, M.A., F.L.S.
Assistant (Museum)	H. F. Tagg, F.L.S.
,, (Herbarium)	W. E. Evans, B.Sc.
,, (Laboratory)	M. Y. Orr.
Head Gardener	*R. L. Harrow.
Plant Propagator	L. B. Stewart.
Assistant Gardener	D. R. Oliver.
Foremen :—	
Arboretum	A. Johnstone.
Glass Department	J. J. Campbell.
Herbaceous Department.	A. McCutcheon.

Glasgow.—Botanic Gardens :—

University Professor	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S
Curator	James Whitton.

London.—Chelsea Physic Garden :—
Curator - - - *W. Hales, A.L.S.

Oxford.—University Botanic Garden :—
Professor - - - F. W. Keeble, C.B.E., M.A., Sc.D., F.R.S.
Curator - - - *William G. Baker.
Curator, Fielding Herbarium - G. C. Druce, M.A., F.L.S.

AFRICA.

Union of South Africa.—

Pretoria—Department of Agriculture :—
Chief, Division of Botany †I. B. Pole Evans. M.A., D.Sc., F.L.S.
Mycologist - - - Ethel M. Doidge, M.A., D.Sc., F.L.S.
" (Herbarium) - A. M. Bottomley, B.A.
Botanist-in-Charge, National Herbarium E. P. Phillips, M.A., D.Sc., F.L.S.
Economic Botanist - - Sydney M. Stent.
Natal Herbarium (Durban) :—
Mycologist in charge - P. van der Bijl, M.A., F.L.S.
Government Mycologist (Cape Town) - V. A. Putteril, M.A.
Department of Forests :—
Chief Conservator - - C. E. Legat, B.Sc.

Cape Town.—National Botanic Garden :—
Director - - - - R. H. Compton, M.A.
Curator - - - - *J. W. Mathews.
Gardener - - - - *A. W. Maynard.

Cape Province.—

Cape Town.—Professor of Botany, South African College. D. Thoday, M.A.
South African Museum Herbarium :—
Assistant in charge - ——
Curator, Bolus Herbarium Mrs. F. Bolus.
Gardens and Public Parks :—
Superintendent - - *G. H. Ridley.

Grahamstown.—Albany Museum :—
Superintendent of Herbarium. S. Schönland, Ph.D.
Gardens and Public Parks :—
Curator - - E. J. Alexander.
Port Elizabeth - Superintendent - John T. Butters.
King Williamstown. Curator - - - George Lockie.
Graaff-Reinet - " - - - *C. J. Howlett.
Uitenhage - " - - - H. Fairey.

Natal.—

Durban.—Municipal Gardens :—

Curator - - -	*H. Rutter.

Pietermaritzburg.—Botanic Garden :—

Curator - - -	*H. H. Kidd.

Transvaal.—

Pretoria.—Transvaal Museum :—

Superintendent of Herbarium.	Mrs. R. Pott.

Egypt.—

Cairo.—Ministry of Agriculture :—

Inspector General -	A. T. McKillop.
Botanical Section :—	
Director - - -	E. Shearer, M.A., B.Sc.
Botanist - - -	M. A. Bailey, B.A.
,, - - -	T. Trought, B.A.
Mycologist - -	H. R. Jones.
Experimental Farms :—	
Inspector - - -	M. W. Gray, M.A., B.Sc.
Horticultural Section :—	
Director - - -	*T. W. Brown, F.L.S.
Assistant Director -	*F. G. Walsingham.
Superintendent - -	*G. S. Crouch.
,,	*H. L. R. Chapman.

Gold Coast.—Agricultural Department :—

Director - - -	W. S. D. Tudhope.
Deputy Director -	—
Mycologist and Assistant Director.	R. H. Bunting.
Mycologist - -	—
Senior Superintendent.	*A. E. Evans.
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